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Theoretical Underpinnings of Acquiring English via Print

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Abstract

This chapter describes a theoretical model of how deaf children could acquire the written version of a spoken language via reading and writing, without exposure to sound or to any representations of sound, including lip reading. The model describes stages of learning which represent successive, conceptual insights necessary for second/foreign language learning via print. The model explains why learning to read is often a protracted process for deaf children and why many fail to make progress after some initial success. Recent studies on deaf children's reading achievements are analyzed as illustrations of the heuristic value of the model. An important teaching implication is that English and sign language should not be viewed as equal languages to be taught together in a bilingual program. Instead, fluent sign language must be present first, and then used as the medium of instruction to teach the written language. Also important is that teaching English phonology is optional, and that curricula should explicitly teach aspects of the writing system that directly convey meaning, such as morphology. English in particular codes rich morphology, sacrificing spelling-to-sound consistency to do so. The model describes a new area of human achievement given that language learning is believed by theorists to require social interaction. Learning a language only from print is thus a human achievement that enlarges our understanding of reading flexibility.

Introduction

Why are deaf students' reading levels low, and so persistently low, despite innovations and changes in educational practices over the last 30 years? In our 2014 paper, Robert Hoffmeister and I argued that what deaf children must learn when faced with print is not just 'reading,' that is, learning to match graphic symbols to sounds and words. They must learn an unknown language at the same time as learning to read (Hoffmeister & Caldwell-Harris, 2014).

Many authors have noted this in the past decades. Barnum (1984) argued that a natural sign language be used as the primary language of instruction in the first four to six grades. This would allow students to develop cognitive/academic skills in a first language that could then facilitate learning English as a second, written language, using the first language to teach the second (Hoffmeister, 2008; Supalla, Wix,& McKee, 2001). Johnson, Liddell, & Erting (1989) argued that deaf children would not have academic success unless the curriculum could be 'unlocked' with ASL used as the primary language of instruction. English would be learned as a written language only after ASL acquisition. Variations on this idea have been discussed by Bockmiller (1981), Strong (1988), Drasgow (1993, 1998), Wilbur (2000) and Hoffmeister (2000) and numerous others. Koulidobrova, Kuntze, and Dostal (2018) wrote: "...the process of learning to read and write is more a task of learning a new language that is based on orthography, rather than a task of mapping print onto spoken language" (p. 112). Recent advocates of English as a second language for deaf children include Howerton-Fox and Falk (2019) and Hrastinski and Wilbur (2016).

In this chapter I adopt a psycholinguistic perspective on why learning a language via print is hard, and why it is sometimes impossible. For convenience I will refer to the written language as English, but the same principles apply to deaf children learning the written form of any spoken language. I review the descriptive model of Hoffmeister and Caldwell-Harris (2014), which includes three stages that many deaf children pass through while learning English. The model describes why learning English (and thus progressing through reading grade levels) frequently stalls. I then review three empirical studies on deaf children's reading successes and failures which illustrate the usefulness of the descriptive model.

The neglect of an interesting problem

Psychologists and educators have no systematic evidence about how to learn a language from reading, nor is it a topic that is discussed in language acquisition textbooks or journals. There is a literature on how to improve one's ability in a foreign language via reading (e.g., Krashen, 2004), but success is only documented for teenagers and adults. Some foreign language courses emphasize learning the written language, but these are also oriented towards teenagers and adults, and success depends on someone who is highly motivated. For these courses, a fluent first language is used as the basis for instruction; and the spoken language can be explained or taught should the learner desire that. So these cases are very different from a deaf child encountering print.

Learning a language via reading should be a topic of high interest to psycholinguists. Its neglect is because it hasn't been recognized as something humans need to do. Psycholinguists spent the 1960s and 70s arguing that language developed via social learning, rather than via an innate language acquisition device (Menyuk, 1971). The proposal that any child could acquire a language, even a second language, via reading was not on anyone's radar. Some discomfort is apparent at the conclusion of Charrow and Fletcher's (1974) paper, published in *Developmental Psychology*. They hypothesized (and found) that because deaf students born to deaf parents had grown up with ASL as their first language, they would demonstrate a pattern of performance on The Test of English as a Foreign Language (TOEFL) that was similar to those of hearing EFL learners. The authors had the courage to title their paper 'English as the Second Language of Deaf Children', but backed off in their final paragraph from any strong implications with the comment, "Whether or not deaf children learn English as a second language may be too broad an issue to investigate." (p. 469). Even psychologists were cautious about pushing back against the hegemony of audism (Lane, 1992).

The advantage of learning via social interaction

Three theoretical ideas about the importance of social interaction are summarized below. The absence of these three aspects of social interaction contributes to the profound difficulty of learning a language via print .

Tracking communicative intent

The commonsensical, folk psychology view is that children learn the meaning of words when a word is uttered (or the sign is gestured) in spatial and temporal contiguity with a visible object, as in *Look at the ball!* Philosophers claimed this could not be sufficient, because induction is too weak to allow learning from mere co-occurrences of an object and an utterance. This is the Gavagai problem, in which a speaker exclaims *Gavagai!* to someone who does not know his language, while pointing to a rabbit running across a field (Quine, 1960). The listener does not know whether *Gavagai* is the word for rabbit, run, animal, animal-parts, or fast. Language acquisition theorists initially solved this problem by proposing that infants and children are born with constraints to make learning possible despite the weakness of induction. An example is the whole object constraint: learners will initially assume a word refers to a whole object rather than a property of an object (Markman, 1990).

Theorists now believe something far more flexible and important facilitates word learning: intended meaning is constrained in real-world situations because learners track the communicative intention of the speakers (or signers) in the discourse context (Baldwin, 1993; Tomasello, & Barton, 1994). Consider the experimental scenarios used by Tomasello, Strosberg, and Akhtar (1996), where an adult brought out a large box of novel objects, announcing to a toddler, *Let's find the gazzer.* Without using language, the adult sequentially picked up objects, rejecting each with a frown or head shake and continued searching. At a random spot in the search, the adult held up the target with an expression of glee. Children were able to fast-map (i.e., one trial learning) the label 'gazzer' to the object, as shown by subsequent tests. This was evidence that spatial-temporal contiguity was not necessary for word learning, but that what mattered was children's ability to track across multiple objects the adult's goal of finding a specific toy. On some trials, individual children even spontaneously cried out *Gazzer!* when the adult's facial expression indicated the sought object has been found.

Other research showed that children will resist learning a word label, even with spatial-temporal co-occurrence of object and word label, if communicative intention is absent. The experimental example of this used a free play situation with no adults in the room. Baldwin (1993) found that toddlers did not learn a word label when they reached for and touched an object, when the word label was pronounced from a loudspeaker. In contrast, learning was successful when all conditions were identical except an adult in the room uttered the label. We inherently intuit that children are tracking speakers' intentions: no one expects a child to fast map the frying pan to the word *damn* even though a parent touched the scorching hot frying pan and immediately yelled *damn*!

Krashen (1985) called utterances that are understandable from context ‘comprehensible input’. One reason children easily learn a second language from social interaction, while adults have more difficulty, is that the language children hear is structurally simple and the meaning is comprehensible from the discourse context. The absence of feelings of achievement that accompany learning via social interaction decreases motivation to learn (Caldwell-Harris and MacWhinney, under review).

Embodied learning

Learning a second language via social interaction has an additional advantage over explicit instruction: Figuring out the meaning of a word via inference leads to deeper and longer-lasting learning than can occur when one is provided a translation. This is because the act of generating an inference allows deep encoding of meaning (Jacoby, 1978). In contrast, learning from popular language teaching tools like duo-lingo or Rosetta Stone are decontextualized from actual experience.

Immediate rewards

The satisfaction of social interaction, the feeling of achievement from successful communication, provides immediate rewards which are absent from the rote memorization and grammar drills of a classroom (Caldwell-Harris, Goodwin, Chu, Dahlen, 2013). Motivation from achieving communicative goals, together with the three advantages listed above, are the reasons why classroom foreign language learning is inferior to learning in an immersion context, and why children learn languages poorly from classroom instruction (Caldwell-Harris & MacWhinney, under review).

The necessity of learning with social interaction is why theorists have assumed language learning from reading is not possible, at least for children. But deaf children have been learning English (or whatever the spoken language may be) via print for the last hundreds of years since deaf communities have formed and have used their native sign language to teach themselves the written forms of spoken languages, as documented by Lane (1992) and described in autobiographical reports (Coleman, 2012; Collins-Ahlgren, 1974; Dalby & Letourneau, 1991; Williams, 1976). Two recent studies have echoed the importance of ASL as the tool for learning written English. One is an ethnography of deaf reading practices (Mounty, Pucci & Harmon, 2014), the other used grounded interviews (Sylvestri & Wang, 2019; described in detail below). Yet psychologists and language acquisition researchers have not studied this process.

How is it possible to learn a language via print? Not easily, due to the absence of the advantages of learning from social interaction. The model described in the next section reflects the consistent themes that Hoffmeister extracted from his work as a researcher and educator of the deaf, and which resonated with what I knew about cognition and language learning as a cognitive scientist, psycholinguist and researcher of ASL acquisition.

Learning English via print, in an uninstructed context

Not all deaf or hard-of-hearing children will need to learn a language via print. Acquiring the spoken language may occur due to residual hearing, access to sound via hearing aids or cochlear implants, or because oral training/cued speech methods were successful. However, these methods often fail (Hoffmeister, 2000). Many deaf children are thus faced with the task of learning the written form of the language via print.

Hoffmeister and Caldwell-Harris (2014) outlined 3 broad stages that deaf children go through when trying to obtain meaning from print. We referred to this as a descriptive model of learning in uninstructed contexts. *Uninstructed context* means that deaf children interact with print in an ad-hoc manner; classrooms lessons are adapted from those designed for hearing children, and are not designed to teach English as a second language.

'English as a second language via print' (ESL-VP) has three stages, from initial exposure to forms, to the final stage of being able to obtain meaning from print in a bilingual learning mode.

Stage 1: Mapping lexical signs (simple translation equivalents)

High frequency, short print words are mapped to their American Sign Language (ASL) signs. This may occur when parents sign CAT or GIRL while pointing to printed words *cat* and *girl* in a picture book. Deaf parents have been observed performing direct mapping when signing picture books to their children; deaf parents frequently teach the manual alphabet with fingerspelling (Padden, 2006). Parents may point to the print words on food items while signing the meaning; this promotes early acquisition of the print forms for words such as *cereal, popcorn, candy, cookie,* and *potato chip*. Factors that influence ease of learning during this initial mapping process are the similarity in meaning between English and ASL forms, and their frequency. Also important are children's and parents' conversational priorities; whether the goal is school readiness, or helping with household chores such as shopping.

The process of mapping single words to single signs continues for a variable period, but at some point, children attempt more complex mappings. Many common English print words must map to ASL phrases, as in the case of English *read* and the ASL phrase READ A BOOK. Slightly more difficult are nouns like *soup*, which map to the ASL verb+noun sequence EAT SOUP.

Stage 2: From words to sentences: simple translation breakdown

For children with a rich first language (L1) and patient parents/teachers who provide mappings, the initial stage of learning can be heady, with rapid acquisition of many translation equivalents. But the success of this strategy sows seeds of failure. Problems occur because single words in any language are only rarely directly mapped to words/signs in any another language or to single nonverbal concepts. The most frequent words in English, as is the case with many languages, are also those with the most idiosyncratic polysemy structure. English phrases like *take the bus* are confusing for deaf children, who think this must mean gain possession of the bus (see Hoffmeister & Caldwell-Harris, 2014).

At this stage learners need to realize that English has unique methods for conveying meaning that need to be learned on their own, not as translations from ASL. This is the stage where children can stall in their reading progress because of the inherent difficulty of figuring out function words, polysemic variations and English syntax. Academic failure and dislike of reading are likely outcomes.

Individuals with innate linguistic aptitude, or those with parents and teachers who explain the purpose of English grammar, can grapple with complex mappings. Interpreting larger word combinations puts learners in a position to process print in a bilingual learning mode.

Stage 3: Bilingual learning mode

Once learners understand that English print constitutes a separate language from ASL, and have a lexicon of basic mappings, they can proceed in a bilingual learning mode, such as Cummins' (1981) theory of the comparative learning process. A bilingual learning model enables learners to understand the lack of translation-equivalency, and how to compensate for this by inferring the meaning of new words from context (Drasgow, 1998). They can make analogies to ASL morphosyntactic and metalinguistic knowledge, and narrative skills gained from story telling in ASL (Czubek, 2006). Perhaps most importantly, learners' fluent first language can be used as the medium of instruction for teaching English polysemy and morphosyntax (Wilbur, 2000).

Summary

The model describes when initial success is rapid (stage 1, mapping translation equivalents), and where learners typically get stuck (stage 2, when simple mappings are insufficient), and also the method of success (using ASL to teach English in a bilingual learning mode).

ESL-VP is too simple to represent the ideal method for using sign language as the medium of instruction for teaching English. Instead, it describes how it is logically possible for some children to accomplish a rather amazing feat, of learning a language without extensive social interaction, in the non-optimal conditions of lacking a curriculum designed for this purpose.

Theoretical and practical implications

As a descriptive model of a route to successful reading, ESL-VP offers implications for theory and practice. These have been noted before by diverse authors but are nonetheless a sharp contrast with mainstream practices.

Implication 1: Learning spoken-word phonology is not necessary when learning a language via print

The traditional view is that representing written words' auditory form is an essential component of reading (Ehri, 2005; Dehaene, 2009). Because of this, some researchers have reasoned that activation of auditory phonological codes must also be essential for reading for deaf readers (Paul, 1998; Perfetti, & Sandak, 2000). But this perspective is not rooted in the science of reading and the science of information processing (Hall & Bavelier, 2010).

There are several reasons to view auditory activation as unnecessary for reading. Humans can process many graphic representations that lack auditory components. Examples include road signs which don't easily activate words, such as a circle with a line through it or icons indicating lane reductions. Ancient writing systems are believed to have begun as pictographic systems (Dehaene, 2009). This is probably because humans' initial goals for writing were to record business transactions. Phonetic components were incorporated into writing systems as societal complexity increased, necessitating general systems for recording any phrase in the language. If the language of general use had been a gestural language, then the phonetic elements would have coded for gestural phonemes.

Modern writing systems have two routes for going from the written word to its meaning (*dual route theory*, see Dehaene, 2009). The semantic pathway causes meaning to be activated directly by graphemes, while the phonological pathway activates representations for sounds, resulting in the auditory image of hearing the sound in one's mind. But meaning can be activated alone, without phonological decoding. In English, semantic activation is often much faster than phonological activation. With increasing reading skill, readers activate less phonology, and may skip the step of phonologically decoding difficult words, because it is more efficient to access meaning directly via the semantic pathway (Dehaene, 2009; Bowers & Bowers, 2018). Low or no activation of phonology frequently occurs when reading Chinese, since cues to pronunciation are absent or unreliable in 2/3 of characters (Cheng & Caldwell-Harris, 2011).

An important piece of empirical evidence is that even good readers did not activate phonological codes during word recognition or recall (Bélanger, Baum, & Mayberry, 2011). This is evidence against the thesis that deficits in phonological codes are responsible for deaf children's reading difficulties (Mayberry, Del Giudice & Lieberman, 2011). But some skilled deaf readers show knowledge of the sounds of words – why? These readers may be employing their residual hearing or may have gained this knowledge as a result of becoming fluent in English (Mayberry et al., 2011).

The irregularity of many spelling systems means that typical hearing readers have the burden of learning many exceptions (Bowers & Bowers, 2018). Ignoring spelling-to-sound patterns is the ideal option for deaf readers, as it allows more time for mapping between orthography and meaning (Grushkin, 1998). Without mapping subcomponents of letter strings to their sounds, in the early stages of learning, deaf individuals must memorize arbitrary strings of letters, sometimes helped by learning their fingerspelled analogues (Padden, 2006). Pertinent to this is Lane's (1992) discussion of Laura Bridgman, a deaf and blind woman of the 19th century. Bridgman recalled being corrected as a child for misspelling *cat*. She had responded why it mattered whether one spelled it 'cta' or 'act' or 'tac'. In the last decades, deaf children have been found to be highly sensitive to the orthographic morphological regularities in words (Grushkin, 1998).

The above research regarding auditory phonological coding suggests that drills in spoken word phonology may indeed be the 'waste of childhood' lamented by critics of audism (Lane, 1992). But what about the reasonable goal of learning to interact with hearing persons via speaking and lipreading? It is time to investigate the following: Learning to orally produce sounds via speech training can proceed with less effort and greater success after English has been learned as a written language.

This thesis was briefly mentioned by Johnson et al. (1989, p.17): "Understanding and producing speech are skills to be developed not as a means of acquisition, but as a result of acquisition, after competence in the language has been established through literacy." The authors did not elaborate on the statement, probably to avoid detracting from their main objective, which was arguing for the right of deaf children to learn a natural sign language and to use that in the classroom for academic learning.

Below I outline the general arguments for the "speech training is easier after learning English" thesis.

Before English is learned as a language

- Speech training for deaf children is effortful, frequently requires hours a day with a professional speech therapist, and therefore detracts from other learning.
- Many children may not understand the purpose of hours spent with fingers on the speech pathologist's throat, trying to articulate sounds.

After English is learned as a language

- Deaf learners can read and write for pleasure, information and human connection.
- The purpose of the hours of speech training are more easily understood, because the learner may have an emotional connection with the written language and thus can anticipate the benefits of additional opportunities to connect with speakers of that language.
- Learning to produce a sequence of sounds for a word is more meaningful because the sequence of sounds can be attached to a known meaning.

The following example elaborates the last point. In typical reading acquired by hearing children, the child has an ‘aha’ moment of phonologically decoding 'mother' and noting: "Wow, that spells a word I know well -- *mother*." If speech training begins after language learning, a deaf child benefits from the same mapping but in reverse: "I am learning the auditory form of that word I've long seen written -- *mother*."

There is currently no data regarding the speed, effort and outcome of speech training before or after learning the written form of a spoken language. This should be prioritized as an area for future research.

Implication 2: The model addresses the question of how ASL is a bridge to reading

It has long been appreciated that acquiring ASL (or other native sign language) is associated with good reading and academic success (e.g., Drasgow, 1998; Hoffmeister, 2000; Wilbur 2000). At the same time, some theorists have been puzzled by how a fluent sign language, being in a different modality and lacking a written form, could be a ‘bridge to literacy’ (Marshark, 2001;

Mayer & Wells, 1996; Mayer, 2017). But 'bridge to literacy' is not the correct way to understand why ASL helps reading, and is a phrase that biases people to focus on the modality difference and ASL being a language without a written form. The primary advantage of ASL for deaf children is foundational and humanitarian: early ASL (or other natural signed language) creates the necessary foundation for future learning, thereby allowing normal cognitive, social and emotional development (Barnum, 1994; Bockmiller, 1981; Corina & Singleton, 2009; Drasgow, 1993, 1998; Humphries, Kushalnagar, Mathur, et al., 2016). ASL at birth thus indirectly helps reading English later in school, since children with normal cognitive and social skills are in the best position to master the difficult task of learning a language via print (or benefiting from any type of school instruction, even non-optimal methods).

There are two additional ways that ASL facilitates acquisition of written English that are part the ESL-VP descriptive model:

- ASL provides the semantic and conceptual structures to which learners map inert print forms (stage 1).
- ASL is the medium of instruction for teaching children English as a second language via print (stage 3).

Recently scholars have argued for the benefits of an additional type of bridge – written forms of ASL. These could be existing sign writing systems, or a to-be-designed alphabet (Gushkin, 2017). Also welcome is ASL glossing, a system of using English words with additional notation to write ASL (Supalla, Cripps, & Byrne, 2017). After the basics of the ASL writing system are learned, written ASL can be used to teach standard elementary school content, thus providing another means of unlocking the curriculum.

Implication 3: Exposing deaf children to ASL is not enough -- Use ASL to teach English

Over the last century, many deaf children suffered language deprivation from policies that replaced the deaf-centered education of the 19th century with the oral practices of the 20th century (Humphries, Kushalnagar, Mathur, 2014; Lane, 1992). The humanitarian need to provide deaf children access to sign language was (and is) so great that many ASL advocates promoted ASL as a way to help deaf children learn to read (e.g., Hoffmeister, 2000). ASL exposure ameliorates language deprivation (Drasgow, 1993; Humphries et al., 2014), but access to ASL does not automatically lead to English literacy (Goldin-Meadow & Mayberry, 2000; Paden, 2006). An example is Knoors and Marschark (2012) who observed that sign language aids deaf children initially by building reading vocabularies, but long-term reading achievement remains elusive. Those authors wrote, "...stagnation occurs, and the reading skills tend to lag or asymptote among deaf children both with and without cochlear implants" (p. 297). In their review of these and related findings, Howerton-Fox & Falk (2019, p. 12) noted: "If we are going to maximize the literacy outcomes for bi/multilingual deaf children, it will be important to understand both the mechanisms through which sign language supports literacy development and the reasons why so many signing deaf children do not become proficient readers and writers."

The answer to these disagreements is the purpose of this chapter: deaf children are asked to do a difficult task (learn a language via print), and the methods used for this are inadequate (Grushkin, 1998). To preview my argument, as proposed by the early advocates for bilingual education for the deaf (e.g., Barnum, 1984; Bockmiller, 1981; Drasgow, 1993, Johnson et al., 1989; Strong, 1988; Hoffmeister, 2000, 2008; Wilbur 2000), ASL must be taught first, to fluency, preferably in a naturalistic environment. Barnum (1984) suggested not introducing English until between grades four and six, to provide time for sufficient mastery of ASL. ASL should be used as the medium of instruction for all academic discourse, including how to teach English as a second language.

Drasgow wrote, “Implementing a bilingual program for deaf students in which ASL is acquired as their first language and English is taught as a second language is no simple matter. There is much to consider” (Drasgow, 1993, p. 247). He reviewed three approaches to bilingual education. In an English-centered approach, English is the primary language, but ASL is used to clarify, to explain difficult material or to answer student questions if necessary.

In the second method, English and ASL are equal in the bilingual classroom even from the earliest grade levels, with both being used and taught at the same time. The drawback of this is lack of a fluent language for instruction and socialization. Lacking a fluent language for classroom discourse, what teachers can do is limited. Techniques like *sandwiching* and *chaining* can be helpful and are used frequently by teachers (Humphries & MacDougall, 1999). In sandwiching, a concept is signed in ASL, then the English word is written and pointed to and then the ASL sign is again presented. Alternatively, the English word “sandwiches” the ASL sign. The goal is for children to infer meaning identity from the rapid juxtaposition of these symbols. Chaining is similar but additional representations of the words can be inserted in the chain, such as a fingerspelled version or a picture or a spoken word version, if speech is used in the classroom. Note that if children were fluent in ASL, teachers could simply state the meaning equivalency using learners’ fluent language, as is the norm in a second language learning situation.

The third method is what was recommended by the early advocates of bilingual education (Johnson et al., 1989 and others cited above): A natural sign language is taught first, learned to fluency, and then used as the medium of instruction for teaching the written language. This method has been employed successfully for decades in Denmark and Sweden (Davies, 1991; Svartholm, 2014). Only the third method is adequate. Children need fluency in ASL first before that language can be used as a medium of instruction for teaching English. The logical result is that English and ASL cannot be equal in the bilingual classroom.

Implication 4: Learning English via print without ASL

Learning the written form of a second language is especially difficult for learners who do not have a fluent first language. Indeed, when Hoffmeister and I developed the descriptive model, we purposely limited it to cases of ASL-using learners, following Hoffmeister's extensive experience with this population at The Learning Center in Framingham and various residential schools around the country. Learning English without fluent ASL skills is highly variable, as shown by larger variances in reading scores for deaf children with hearing parents compared to deaf children with deaf parents (as in Figure 3, Novogrodsky, Caldwell-Harris, Fish, & Hoffmeister, 2014).

When there is no fluent L1, there is no large storehouse of vocabulary items to be mapped to printed words, there is no model of linguistic structure to be used as a source domain for analogical explanations, no fluent language to be used to discuss motivation, career aspirations and the future long-term benefits of literacy (see Albertini, Kelly, & Matchett, 2011, for a discussion of motivation in deaf college students). From the cognitive, social, language development and humanitarian perspectives, there can be only one recommendation for children who do not have a fluent first language: remediate language deprivation. The helpfulness of English literacy (which cannot be obtained without a fluent L1) pales compared to the intelligence and socialization to be gained by acquiring a fluent first language in a naturalistic learning context. Set aside a number of years to acquire a natural signed language in a naturalistic context, teaching the standard curriculum with ASL (plus ASL writing system),whenever possible (Barnum, 1984; Grushkin, 1998, 2017).

The perspectives about language acquisition reviewed in the introduction suggest that the written version of a spoken language cannot be fully acquired via print without a fluent L1. In the next sections I review recent studies relevant to this claim.

The heuristic value of ESL-VP: a review of three recent studies

The first article reviewed describes accomplished readers, who grew up with ASL and who succeeded in learning English via print using a bilingual learning mode (Silvestri & Wang, 2018). The second article involves a group of profoundly deaf individuals who were orally-trained yet as adults were identified as skilled readers (Domínguez, Carrillo, del Mar Pérez, & Alegría, 2014). The third study reports on sign-word mapping practices for children in a bilingual school (Van Staden, 2013).

Review 1: The reading strategies and experiences of high achieving deaf readers

Many authors have noted that the field of deaf education lacks "insight into effective reading processes used by deaf people" (Silvestri & Wang, 2018, p. 423). To fill this gap, Silvestri and Wang (2018) interviewed 30 deaf individuals on how they learned to read and assessed their reading strategies with a think-aloud protocol. This research address topics Hoffmeister and I have pursued in the past years in unpublished work (Caldwell-Harris& Hoffmeister, 2020). A prediction is that these individuals had access to ASL growing up and used it to learn English as their second language. This indeed was one of the main findings of the interviews.

The adult interviewees were selected so that 15 were categorized as high achieving readers (those with graduate degrees who reported reading extensively for professional level jobs) and 15 as low achieving readers, self-identified as struggling readers with language barriers. The authors also included 15 high achieving hearing readers, with similar educational and professional attainments as the deaf group, and 15 low achieving hearing readers. The interviews focused on language experience, instructional methods and reading activities while growing up. Using the think-aloud method, participants read a passage from Macbeth with rhyming verses. This allowed them to report on their awareness of rhyme and other poetic elements.

The first question I asked in scrutinizing Silvestri and Wang's (2018) data was what reading experiences and strategies differed most strongly between the high achieving and low achieving deaf readers. I subtracted the number of low achieving deaf who mentioned a strategy/experience from the number of high achieving deaf who mentioned that same strategy/experience, and then sorted these difference scores from highest to lowest. In Table 1 the top 20% of items on this list have been sorted into two broad categories, *Importance of ASL* and *Comprehension Strategies*

'Signing at home' was the item that most strongly distinguished the high and low achieving readers. Also mentioned often by the good readers were use of ASL in elementary school, reading with parents, and parents signing stories. The high achieving deaf participants resembled the high achieving hearing participants on their report of using comprehension strategies for attaining optimal comprehension.

The deaf high achievers used ASL to comprehend the Macbeth passage. High achievers reported translating character dialogue by using role-shift in ASL (e.g., "He said that they would...."). One assumes this is the feeling or bodily image of a shoulder shift, the ASL marker for dialogue change. However, it would be ideal to have more information about this, such as how frequently ASL users have a bodily experience of a shoulder shift when they are reading in a written language about reported language or other aspects of dialogue.

The interviews provide strong support for ESL-VP by showing that high achieving readers used ASL to support their learning. Indeed, the good readers mentioned using sign language in literacy instruction, and they used ASL for interpreting texts. The findings suggest that these readers learned by being in a bilingual learning mode, which Hoffmeister and I characterized as necessary for learning English and thereby attaining reading fluency.

Place Table 1 here

Review 2: Gaining information from print via keywords

Domínguez et al (2014) open their detailed study of the reading abilities and strategies of orally trained deaf adults by remarking: "A vast body of literature has shown that deaf persons are generally handicapped at the syntactic level ....[multiple citations]... Nevertheless, reading requires syntax, that is, the ability to integrate morphemes into larger linguistic units such as phrases...." (p. 1441) This quote motivated their research question: does a lack of syntactic knowledge limit the average reading abilities for deaf adults to the 4th or 5th grade level?

The deaf individuals studied by Domínguez et al. (2014) were exposed to Spanish via oral methods, although by adulthood these adults used sign language in their daily interactions. The authors selected deaf individuals, age range 18-55, who were good readers and read daily for information and enjoyment. Participants had a university degree or had pursued non-compulsory technical training.

In their prior work, the authors had observed orally trained deaf adults using semantic strategies when reading Spanish. In the "keyword" strategy, a reader uses the most frequent content words to infer sentence meaning, ignoring function words. The authors noted:

> ....this strategy is not compatible with a thorough understanding of written material, so it can explain at least partially why deaf persons hardly ever achieve high levels of reading. The main problem, however, is to understand why the key word strategy is so widely used among deaf readers. It must necessarily be related to their linguistic competence at all levels, syntactic, lexical, and phonological (Domínguez et al., 2014, p. 1441).

Reading level was measured using a forced-choice sentence completion test, the READ test. All choices were orthographically similar; two of the distractors were pseudowords. Targets included difficult vocabulary items, such as *submersible*, allowing the test to measure a wide range of reading levels. Additional tests assessed Spanish vocabulary, syntactic and morphological? ability.

The primary finding was the reliance on the keyword strategy. Even individuals selected to be accomplished readers with university degrees and post-compulsory education used the keyword strategy, as revealed by their low scores on the sentence completion task. Their reading ability, when matched to hearing children, was either low (below 4th grade level), intermediate (between 6th and 7th grade), or superior level, reading slightly beyond hearing readers of 10th grade level. Even those in the superior group overused semantic strategies and underutilized sentence-level syntax when reading.

The authors wondered if the key word strategy would disappear as syntactic ability increased. It did not. The authors concluded, "using the key word strategy during long periods of time increases knowledge of content words but not syntax, probably because function words are neglected by this strategy" (Domínguez et al., 2014, p. 1451).

This rich study provides a wealth of insights pertinent to deaf persons learning a language via print. Reading competence following oral training was highly uneven, with strong semantic and inferential capabilities, and weak morphosyntax. The findings fit the descriptive model of Hoffmeister and Caldwell-Harris as follows. The orally trained deaf Spaniards learned to map many words to concepts, as in our Stage 1. They became stuck at Stage 2. Without a fluent L1 for conversation, scaffolding, explicit instruction and as an example of morphosyntax, these individuals had uneven success when grappling with meaning at the sentence level.

This study also raises questions and ideas for future research. The Domínguez et al. (2014) study indicates that, following oral training, semantic strategies curtail acquiring the syntax of the written language. What components of full linguistic competence can be learned when a language is learned via print without a fluent L1 to scaffold explicit instruction? When no sign language is available in the classroom due to oral training, sign language is typically learned either outside of the classroom or acquired later, often when deaf individuals socialize as teenagers (Lane, Hoffmeister and Bahan, 1996). How much and how often can this later-learned ASL correct for semantic reading strategies acquired during oral training? Can explicit instruction in the syntax of the written language in adulthood compensate for lack of explicit instruction during childhood?

Review 3: Elaborating the print-to-sign mapping task

Consistent with viewing deaf children's task as learning a language via print, Van Staden (2013) wrote, "the major impediment to deaf children's reading development is not simply an inability to speak English but rather insufficient language development…A further complication is a discrepancy between deaf children's incomplete spoken language system and the demands of reading a speech-based system" (p. 306).

Van Staden (2013) reports on an English vocabulary intervention to boost deaf children's ability to grasp and retain the meaning of English print words, working with students at a residential school for the deaf in South Africa. The school had a bilingual sign policy, with South African Sign Language (SASL) taught alongside written English. The bilingual school appears to be the second option described in the prior section, where English and sign language had equal status as languages that needed to be taught. English print vocabulary was explicitly mapped to SASL signs, using the techniques of sandwiching and chaining (Humphries & MacDougall, 1999). Additional multimodal methods were part of teaching, including tracing words on sandpaper, creating clay models of the words and their meanings, sorting vocabulary cards into different semantic categories, signing stories from a print book, and picture/word/sign matching exercises.

This vocabulary intervention represents stage 1 of ESL-VP, *Mapping translation equivalents*. Because SASL was being learned at the same time as English, a fluent sign language was not available to explain the challenges of stage 2, such as confronting complex word combinations, dealing with English polysemy or morphosyntax. However some practices are suggestive of the bilingual learning mode of stage 3: "...students using their sign language skills to establish an interactive reading environment, and guiding them, through scaffolding, to apply the comprehension strategies" (Van Staden, 2013, p. 308). According to ESL-VP, learners cannot develop full comprehension of English without a fluent L1 for explicit instruction in English grammar and difficult areas like polysemy. What is unknown is whether the students described by Van Staden (2013) are on a path to resemble the orally trained students described in the previous study -- with vocabulary items mapped to meanings and signs, but not integrated into a language system -- despite being educated at a bilingual school.

Developing the conversation around teaching a language via print

Below I outline some broad suggestions for enlarging the conversation about deaf children's reading, in addition to the four implications reviewed earlier (spoken word phonology not necessary; ASL is a bridge to reading via explicit instruction; exposure to ASL is not enough to facilitate English literacy; English cannot be learned via print without a fluent first language).

Acknowledge that for many deaf children the task is language learning, not 'reading.'

Changing our view from ‘learning to read’ to ‘learning a language via reading’ gives us a new perspective on many problematic aspects of the deaf education literature and mindsets of some researchers.

Signposts of inaccurate views will be familiar to readers of this volume and include:

- Teaching interventions that focus on increasing deaf children's reading vocabularies, without reference to the need to learn the target language (e.g., Van Staden, 2013). This practice can then deepen nascent semantic or 'keyword' approaches to reading.
- Comparing deaf children's written language skills to those of hearing, monolingual children's written language skills. Deaf children can only be expected to approximate the written language skills of hearing children when they are given the same advantage as hearing children, of an accessible language from birth. Even with that advantage, the comparison should be to bilingual hearing children.
- Drawing conclusions about deaf children's cognitive or other abilities while not recognizing they are being assessed in a non-proficient language (see discussion in Lane, 1991).
- Viewing deaf children's reading failures as occurring because of their deafness, their lack of access to phonology, and/or their poor language skills, rather than the difficulty of being asked to read an unknown language.

Teaching English morphology is useful for hearing and deaf learners

What sense should deaf learners make of the letter sequences composing words, if they are not learning letter-sound mappings? Words are composed of parts; and there is a structure to those parts that will facilitate learning English. Letter clusters like *un, re* and *ment* can be mapped to meanings. Parents and teachers can explicitly teach the morphology of English words, something that has recently been advocated by Humphries (2014). It is thus provocative that reading experts have also recently argued that standard reading curricula should be revised to more explicitly teach children English morphology (Bowers and Bowers, 2018). The reason is that English sacrifices spelling-to-sound consistency to make the meaning-bearing parts of words salient; consider the usefulness of spelling similarity across words like *southern* and *south; health* and *heal*. The morphemes *south* and *heal* can activate their meanings rapidly, independently of phonological activation.

Morphological awareness enables readers to partition and understand words based on meaning rather than surface features alone (Trussel & Easterbrooks, 2017). Skilled deaf readers tend to have good command of English morphology (Clark, Gilbert, & Anderson, 2011). Interventions to teach deaf children morphology has led to improvement in reading comprehension and writing skills (Nunes, Burman, Evans, & Bell, 2010).

Draw on foreign language learning curricula which use written materials or emphasize reading as part of language learning

Foreign language learning materials for children typically emphasize face-to-face social interaction, such as routines for greeting and friendly information exchange. These could be adapted to text-based media such as texting and computer chats for educating deaf students. I briefly describe two examples that teach L2 via print.

A technique called enhanced subtitling helps connect written vocabulary words to their real-world referents and conceptual knowledge (Hassan & Neves, 2019). Written vocabulary words were taught to deaf children in Qatar by superimposing the written label on the object that is part of the ongoing video story. Students acquired these vocabulary words better than did those assigned a control lesson.

The company One-third Stories developed a technique to teach foreign languages to young children via picture books, captured by their slogan, *Stories that start in English and end in a different language* (onethirdstories.com). An inherently interesting story begins in the first language, with a rich context established with full color illustrations. Phrases in the second language are inserted in places where the context will make them interpretable, as in, "The little boy looked into the sky at the bright, round, yellow *soleil*." By the end of each book, 1/3 of the text is in the second language. This program is unusual in teaching a second language via print to young children, using the fluent L1. This method could be easily adapted for deaf learners, for those who know a writing system like ASL Gloss (Supalla et al., 2017), or other writing system to be developed (Glushkin, 2017).

Conclusions: Looking forward

Arguments that the deaf are a linguistic and cultural minority and thus have a right to use their native language in the classroom have been repeatedly made and ignored (Drasgow, 1998; Hoffmeister, 2008; Lane 1992). There is now new momentum to make changes in deaf education. Koulidobrova et al. (2018) argue that deaf children should be identified as English language learners, thus eligible for federal resources to facilitate using their native language in the classroom. Howerton-Fox and Falk (2019) renew and elaborate the call for bilingual education. Withholding a visual language from deaf children is now understood to be a human rights violation; this may also spur a paradigm shift in deaf education (Grosjean, 2001; Humphries et al., 2016).

When the task facing deaf children is conceptualized as reading, deaf children are on their own to figure out the English language. When they are successful, this represents a human achievement akin to the famous mathematician Srinivasa Ramanujan discovering advanced mathematical principles while growing up in 19th century India. A different mathematical example highlights the extraordinary in all of us: Probabilistic thinking gradually became part of the intellectual toolkit of people in the developed world in the centuries after the pioneering writing of Blase Pascal and Pierre de Fermat in the 17th century (Gigerenzer, Swijtink, Porter, & Daston, 1990). The result of that shift is that contemporary children easily learn to use probabilistic thinking, because of its omnipresence in everyday life and scaffolding in school. Yet the concepts of percentages and probabilities eluded the mathematicians of Renaissance Europe for centuries, despite their necessity to the everyday dice or cards gambler. My point is that seemingly difficult problems, when scaffolded by the larger culture and the school system, become tractable. This suggests that the problem of teaching a language via print, when it becomes normative to educators, can similarly be submitted to the engines of human ingenuity: studied by scientists, curricula developed by informed educators, debated and discussed by teachers, tested, revised, developed again. Humankind will crack the problem of how to teach a language via print, and children will learn. We just need to recognize that learning a language via print is something humans need to do.

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