AN UNDERSTANDING OF THE LITERACY LEVELS OF STUDENTS

Who are Deaf/Hard-of-Hearing in the United States, China, and South Korea

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Abstract

This paper presents a synthesis of the research findings of the literacy levels and difficulties of deaf/hard of hearing children and adolescents in the United States, China, and South Korea. After discussing general achievement levels, we provide a brief introduction to the nature of the three writing systems (English, Chinese, and Korean) to establish an explanatory framework that accounts for the status of the current literacy levels. We assert that the three writing systems are designed, at the least, to fit the phonological structures of the languages for which they represent. We also argue that there is a reciprocal, facilitative relationship between lower-level (e.g., decoding) and higher-level (e.g., comprehension, composing) skills. To establish this reciprocity, children need to develop competence in phonology, specifically, and in other general language components (e.g., morphology, syntax, semantics, and pragmatics) of the language of print. Many children may also need to learn how to comprehend or compose (e.g., develop higher level metacognitive, inferencing skills).

Keywords: alphabetic code, deaf, hard of hearing, literacy, lower-level skills, higher-level skills, orthography, phonology.

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Chinese
[Translation Shek Kam Tse]
此篇文章綜合報告了關於美國、中國和韓國的聾啞和聽力障礙兒童及成人的讀寫水準和困難的相關研究發現。在討論基本成績水準之後，我們介紹了三個不同文字系統（英語、中文和韓文）的特點，用以建立一個解釋框架去表達現有的讀寫水準。我們認為這三種文字體系的設計基本上符合他們所表達語言的語音學結構，我們也堅信在低級（解碼）能力和高級（理解和造句等）能力之間有一個相互促進的關係。為了建立這種交互性，兒童需要發展出對包括語音學在內的各種書面語言結構（詞語形態、語法、語義和語用等）的瞭解。很多兒童還需要學習如果理解和造句（例如：發展高級的自我意識和推理能力等）。

Dutch
[Translation Tanja Janssen]
TITEL. Het begrijpen van de geletterdheid van leerlingen die doof zijn of slechthorend, in de Verenigde Staten, China en Zuid-Korea
SAMENVATTING. Deze bijdrage presenteert een synthese van onderzoeksbevindingen over de geletterdheidniveaus en –moeilijkheden van dove en slechthorende kinderen en adolescenten in de Verenigde Staten, China en Zuid-Korea. Na een bespreking van algemene prestatieniveaus, geven we een korte inleiding over de aard van de drie schrijfsystemen ((Engels, Chinees en Koreaans) om zo een verklarend framework te geven voor de stand van zaken van de geletterdheidsniveaus. We stellen dat de drie schrijfsystemen, op zijn minst, ontworpen zijn om de fonologische structuren weer te geven. We betogen ook dat er een wederkerige, faciliterende relatie is tussen lagere orde (bv. decoderen) en hogere orde vaardigheden (bv. begrijpen). Om deze wederkerigheid tot stand te brengen, moeten kinderen competentie verwerven in fonologie, in het bijzonder, en in andere algemene taalcomponenten (bv. morfologie, syntaxis, semantiek, pragmatiek) van schriftelijke taal. Veel kinderen zullen ook moeten leren hoe je tot begrip komt of hoe je schrijft (d.i. het ontwikkelen van hogere orde, metacognitieve vaardigheden).
TREFWOORDEN: alfabet, doof, slechthorend, geletterdheid, lagere orde vaardigheden, hogere orde vaardigheden, orthografie, fonologie

French
[Translation Laurence Pasa]
TITRE. UN ÉCLAIRAGE SUR LES NIVEAUX DE LITERACY DES ÉTUDIANTS
RÉSUMÉ. Cet article présente une synthèse des résultats de recherche relatifs aux niveaux de literacy et aux difficultés rencontrées par les enfants et les adolescents sourds/malentendants aux États-Unis, en Chine et en Corée du Sud. Après une présentation des niveaux d'acquisition généraux, nous proposons une brève introduction sur la nature des trois systèmes d'écriture (l'anglais, le chinois et le coréen), afin d'établir un cadre explicatif qui puisse intégrer les différents niveaux de literacy observés. Nous affirmons que les trois systèmes d'écriture sont adaptés aux structures phonologiques des langues qu'ils représentent. Nous soutenons aussi qu'il existe une relation circulaire et facilitatrice entre les compétences de bas niveau (comme le décodage) et de plus haut niveau (comme la compréhension, la production). Pour établir cette réciprocité, les enfants doivent développer des compétences en phonologie tout particulièrement, mais aussi en lien avec d'autres composantes du langage écrit (par exemple. la morphologie, la syntaxe, la sémantique et la pragmatique). Beaucoup d'enfants peuvent aussi devoir apprendre comment comprendre ou produire (par exemple, développer des compétences de plus haut niveau, metacognitives, inférentielles).
MOTS-CLÉS : code alphabétique, sourds, malentendants, literacy, compétences de bas niveau, compétences de haut niveau, orthographe, phonologie.

German

[Translation Irene Pieper]

TITEL. Zum Verständnis der Literalitäts-Stufen von Lernenden, die in den Vereinigten Staaten, China oder Südkorea gehörlos oder hörgeschädigt sind

ZUSAMMENFASSUNG. Der Artikel bietet eine Synthese der Forschungsergebnisse im Bereich der Literacfy Levels und Schwierigkeiten von Kindern und adoleszenten LernerInnen in den Vereinigten Staaten, China und Südkorea. Nach einer Diskussion allgemeiner Stufenmodelle führen wir knapp in die drei Schriftsysteme ein (englisch, chinesisch, koreanisch), um einen Erklärungsrahmen zu schaffen, der den Status der bestehenden Stufen begründet. Unserer These nach sind die drei Schriftsysteme so aufgebaut, dass sie den phonologischen Strukturen der Sprachen entsprechen, die sie repräsentieren. Wir argumentieren darüber hinaus, dass zwischen hierarchieniedrigen und hierachiehöheren Fähigkeiten ein reziprokes Verhältnis besteht, das das Verständnis erleichtert. Um diese Reziprozität herstellen zu können, müssen die Kinder phonologische Kompetenzen erwerben, aber auch solche Kompetenzen, die sich auf weitere Aspekte der Schriftsprache beziehen, so z. B. auf die Morphologie, Syntax, Semantik, Pragmatik. Viele Kinder müssen vermutlich auch lernen, wie das Verständnis größerer Einheiten aufgebaut werden kann (z.B. müssen sie hierarchiehöhere metakognitive Fähigkeiten sowie die Fähigkeit zur Inferenzbildung entwickeln).

SCHLAGWORTER: alphabetischer Code, gehörlos, hörgeschädigt, Literacy / Literalität, hierarchieniedrige Fähigkeiten, hierarchiehöhere Fähigkeiten, Orthographie, Phonologie

Italian

[Translation Manuela Delfino, Francesco Caviglia]

TITOLO. La comprensione del livello di alfabetizzazione di studenti sordi o con limitazioni dell'udito negli Stati Uniti, in Cina e in Corea del Sud

SOMMARIO. Questo contributo presenta una sintesi dei risultati di ricerca sui livelli di alfabetizzazione e le difficoltà dei bambini e degli adolescenti sordi/con limitazioni dell'udito negli Stati Uniti, in Cina e in Corea del sud. Dopo aver discusso in generale i livelli di competenza raggiunti, forniamo una breve introduzione alla natura dei tre sistemi di scrittura (inglese, cinese e coreano) per fornire un quadro esplicativo che renda conto dello stato degli attuali livelli di alfabetizzazione. Secondo noi i tre sistemi di scrittura sono progettati, almeno in qualche misura, per adattarsi alle strutture fonologiche delle lingue che rappresentano. Sosteniamo anche che c'è un reciproco rapporto di agevolazione tra le competenze di livello inferiore (ad esempio, la decodifica) e quelle di livello superiore (ad esempio, la comprensione, la composizione). Per stabilire questa reciprocità, i bambini hanno bisogno di sviluppare competenze in fonologia, in particolare, e in altri componenti generali della lingua (ad esempio, morfologia, sintassi, semantica e pragmatica) del linguaggio di stampa. Molti bambini possono anche avere bisogno di imparare a capire o a comporre (per esempio, per sviluppare abilità più sofisticate come quelle meta-cognitive e inferenziali).

PAROLE CHAIVE: codice alfabetico, sordi, ipo-udenti, alfabetizzazione, abilità di ordine inferiore, abilità di ordine superiore, ortografia, fonologia

Polish

[Translation Elżbieta Awramiuk]

TITUŁ. Rozumienie poziomu umiejętności czytania i pisania uczących się osób głuchych i z zaburzeniami słuchu w USA, Chinach i Korei Południowej

STRESZCZENIE. Artykuł stanowi syntezę wyników badań nad poziomem umiejętności czytania i pisania oraz trudności dzieci i nastolatków głuchych / z zaburzeniami słuchu w USA, Chinach i Korei Południowej. Po przedstawieniu ogólnych poziomów osiągnięć, prezentujemy krótkie wprowadzenie dotyczące trzech systemów pisma (angielskiego, chińskiego i koreańskiego), aby umożliwić wyjaśnienie statusu powszechnie przyjętych poziomów czytania i pisania. Potwierdzamy, że te trzy systemy pisma odzwierciedlają, przynajmniej w zamyśle, struktury fonologiczne języków, które reprezentują. Twierdzimy także, że istnieje wzajemna, pomocna relacja między umiejętnościami z poziomu niższego (np. dekodowanie) a wyższego (np. rozumienie, komponowanie). Aby ustalić tę wzajemność, dzieci potrzebują szczególnie rozwijania kompetencji fonologicznej, a także innych ogólnych komponentów (np. morfologii, składni, semantyki, pragmatyki) języka pisanego. Wiele dzieci powinno także uczyć się rozumienia i komponowania tekstów (np. rozwijanie wyższych metakognitywnych umiejętności wnioskowania).

SLOWA-KLUCZE: kod alfabetyczny; niesłyszący; osoby z zaburzeniami słuchu; umiejętność czytania i pisania; umiejętności niższego rzędu; umiejętności wyższego rzędu; ortografia; fonologia

Portuguese
[Translation Sara Leite]
TITULO. UMA COMPREENSÃO DOS NÍVEIS DE LITERACIA DE ESTUDANTES SURDOS / COM DIFICULDADES AUDITIVAS NOS EUA, A CHINA E NA COREIA DO SUL
RESUMO. Este artigo apresenta uma síntese dos resultados de uma investigação sobre níveis de literacia e dificuldades de crianças e adolescentes surdos ou com dificuldades auditivas nos Estados Unidos da América, na China, e na Coreia do Sul. Após a discussão dos níveis gerais de sucesso, apresentamos uma breve introdução, sobre as características dos três sistemas de escrita (inglês, chinês e coreano) para estabelecer um quadro explicativo que permita compreender a situação dos actuais níveis de literacia. Afirmamos que os três sistemas de escrita são concebidos, pelo menos, de acordo com as estruturas fonológicas das respectivas línguas. Argumentamos igualmente que existe uma relação recíproca e facilitadora entre as competências de nível elementar (por exemplo, a decifração) e as de nível superior (por exemplo, as de compreensão e composição). Para estabelecer esta reciprocidade, as crianças precisam de desenvolver competências fonológicas, especificamente, bem como noutras componentes linguísticas (por exemplo, morfológica, sintáctica, semântica e pragmática) da língua escrita. Muitas crianças precisam ainda de aprender a compreender ou a compor (isto é, de desenvolver competências de nível superior, por exemplo ao nível das inferências e da metacognição).
PALAVRAS-CHAVE: Código alfabético, surdo, dificuldades auditivas, literacia, competências de nível inferior, competências de nível superior, ortografia, fonologia.

Spanish
[Translation Ingrid Marquez]
TÍTULO. Comprender los niveles de habilidad en lectoescritura de los estudiantes sordos o con deficiencias auditivas en los estados unidos, china y korea del sur
RESUMEN. Este ensayo presenta una sintésis de los resultados de las investigaciones sobre niveles de habilidades en lectoescritura entre los estudiantes, niños y adolescentes sordos o con deficiencias auditivas en los Estados Unidos, China y Korea del Sur. Después de discutir los niveles generales de competencia, damos una breve introducción a la naturaleza de los tres sistemas de escritura (inglés, chino y koreano) para establecer un marco que explique los niveles de habilidades actuales en cada uno. Consideramos que los tres sistemas de escritura son diseñados para cuando menos cumplir con las estructuras fonológicos de los idiomas que representan. También argumentamos que hay una relación recíproca facilitadora entre el nivel de habilidades bajo (e.g., la decodificación) y alto (e.g., la comprensión y composición). Para establecer esta reciprocidad, los niños necesitan desarrollar su competencia en la fonología específicamente, y en otros componentes generales del dominio de un idioma escrito (e.g., la morfología, sintáxis, semántica y pragmática). Muchos niños también pueden necesitar prácticas de comprensión y composición (e.g., desarrollar habilidades mejores de inferencia y a nivel metacognitivo).
PALABRAS CLAVE: Código alfabético, sordo, con deficiencias auditivas, habilidades de lectoescritura, habilidades de bajo nivel, habilidades avanzadas, ortografía, fonología.

1. INTRODUCTION

Since the beginning of formal assessment, researchers have consistently documented that the average student who is deaf or hard of hearing in the United States leaves high school with reading comprehension skills at approximately the third or fourth grade level (e.g., Paul, 1998, 2003, 2009; Pintner & Patterson, 1916; Qi & Mitchell, 2007; Trezek, Wang, & Paul, 2010). A parallel pattern can be found elsewhere in other countries. For example, although reliable up-to-date statistics are not available due to the dearth of research, most students, who leave school, are reading at least three grades below their hearing peers after the 9-year compulsory education period in China (Wang, 2003). Similarly, in Korea most deaf students in high school are reading at the fourth or fifth grade level upon graduation (e.g., Choi, Ahn, & Kim, 2006; Jung, 2007).

There is no universal entity called *reading* that is independent of a particular language on which it is based, specifically with respect to how that language is written down (i.e., the writing system) (McGuinness, 2004, 2005; Snow, Burns, & Griffin, 1998; Snowling & Hulme, 2005). A reading problem in one writing system is not necessarily a problem in another due to the various ways speech sounds (i.e., phonemes) are mapped onto symbols in different written language systems (McGuinness, 2004, 2005). For example, in English-speaking countries, decoding accuracy (i.e., identification of isolated words one at a time) is one of the main indicators of reading achievement whereas in Spanish-speaking countries, reading fluency and reading comprehension are the major measurements of reading achievement because there is mainly one way to write each phoneme and one way to decode each letter or digraph (e.g., *th* in *the*). Consequently, just about every child, who is typical or does not have a significant disability, can decode accurately and learn to read (McGuinness, 2004, 2005).

We begin with a brief introduction on the nature of the three writing systems: English (American), Chinese, and Korean. Then we discuss briefly the reciprocal, facilitative relationship between lower-level (e.g., decoding) and higher-level (e.g., comprehension, composing) skills. Much of our focus is on reading; however, a similar analogy can be made for writing. In fact, there is also a reciprocal relation between reading and writing.

2. THE ENGLISH WRITTEN LANGUAGE SYSTEM IN THE UNITED STATES

English is an alphabetic language in which the written form encodes the spoken form, that is, letters (i.e., graphemes) represent the sounds (i.e., phonemes) (Adams, 1990; McGuinness, 2004, 2005; Snowling & Hulme, 2005). The English alphabet code produces a highly opaque writing system in which there are multiple spellings for the same phoneme and multiple decodings for the same letter or digraph. The general rule of letter-sound correspondence is still reliable. Hanna and colleagues (Hanna, Hanna, Hodges, & Rudorf, 1966) studied all the spelling alternatives for sounds in the English language. As an example, they found that *ai* occurs in 314 out of 17,310 English words they studied. In 271 of those words, *ai* has the long *a* sound as in *rain*; in 37 words, *ai* occurs in an unstressed syllable where the vowel sound is severely muffled as in the word *mountain*; *ai* has the short *e* sound in four words; the short *a* sound in one word, *plaid*; and the long *i* sound in one word, *aisle*. In sum, *ai* is regular 98% of the time.

Reading is a complex cognitive and linguistic activity. There is no single factor that can explicate the range of difficulties that impede the development of reading in English. Much attention has been devoted to phonological processing/awareness issues (e.g., grasping the sound structure of words and understanding phoneme-grapheme links). Slow, inconsistent development in this area results in an incomplete, inaccurate understanding of the alphabetic system. Improving phonological and phonemic awareness alone, albeit still critical, may not be sufficient for many struggling readers. That is, attention must also be devoted to other language-based

areas such as fluency, vocabulary, and text comprehension and even to other language components such as morphology and syntax, especially for deaf or hard of hearing students (e.g., McGuinness, 2004, 2005; National Reading Panel, 2000; Paul, 2003, 2009; Trezek et al., 2010).

Nevertheless, the poor decoding (lower level) skills of struggling readers who are deaf or hard of hearing prohibit them from reading accurately with speed and proper expression (i.e., fluency). Moreover, without understanding the print at the word level, these readers have difficulties comprehending the print at the sentence or passage level—that is, there is a breakdown in the reciprocal relation between word identification (decoding) and comprehension. Even deaf students who know American Sign Language or another first language need to acquire competence in the language of print, specifically phonology, to develop this reciprocity (Paul, 2001, 2009; Trezek et al., 2010; Wang, Kretschmer, & Hartman, 2008). Struggling readers who are deaf or hard of hearing cannot even use their understanding of the text to facilitate the learning of new words as skilled readers typically do. The lack of a reciprocal, facilitative relationship between lower-level and higher-level skills in reading puts many students at a disadvantage.

In essence, early reading acquisition in a phonemic language such as English entails a working knowledge of or, perhaps for many children, direct instruction in the alphabetic code (Chall, 1996; National Reading Panel, 2000; Stanovich, 1993/1994). In the field of deaf education, there is an intuitive belief that a hearing loss limits or prevents students from accessing the phonological system of English. This has led to the fact that the majority of teachers do not incorporate phonemic awareness (i.e., manipulation of sounds) and phonics (i.e., letter-sound correspondence) activities in their reading instruction (LaSasso & Mobley, 1997). Many researchers believe that such a lack of direct decoding instruction in phonemic awareness and phonics skills may partly account for the reading difficulties of students who are deaf or hard of hearing in the United States (Leybaert, 1993, 2005; Paul, 1998, 2009; Trezek et al., 2010; Wang, Trezek, Luckner & Paul, 2008).

In light of the extant research on English reading, it is clear that phonological knowledge is critical for developing phonemic awareness and for enabling individuals to learn the alphabet system upon which the writing of English is based (e.g., Adams, 1990; McGuinness, 2004, 2005; National Reading Panel, 2000). Because of the issue of *hearing*, there is also evidence that many deaf and some hard of hearing students have difficulty accessing phonology to acquire competency in English (i.e., the spoken or conversational form) and to use this phonological knowledge as a part of the reading process. Consequently, there have been attempts to develop phonological knowledge in these individuals via alternative *visual* modes such as cued speech and visual phonics (e.g., see reviews in Paul, 2009; Trezek et al., 2010; Wang, Trezek, Luckner & Paul, 2008).

The use of these alternative means is in its infancy, but there is emerging research support (e.g., see review in Wang, Trezek, Luckner & Paul, 2008). The documented success seems to indicate that it is possible for deaf and hard of hearing students to acquire phonological knowledge when this information is represented and conveyed via a visual, non-soundbased medium such as the use of hand signs or movements as is the case for cued speech and visual phonics. In general, phonemes

are abstract entities, and the acquisition of these entities as well as other aspects of phonology is cognitively based and may not be *mode* (i.e., visual or hearing) dependent (e.g., see discussions in Paul, 2009; Trezek et al., 2010). Despite the initial success of current, limited research, it still remains to be seen if the acquisition of phonology via a visual mode is equivalent to or results in the use of skills that are commensurate to the typical, peripheral route of acquisition via *hearing* as is the case for children with typical hearing. If phonological success can be established, then deaf or hard of hearing children and adolescents have the initial skills for advanced reading development.

If reading becomes fairly established, then it is possible to anticipate a potential success in the development of written language. Reading and writing (i.e., decoding and encoding) are essentially a mirror image of one another (McGuinness, 2004, 2005). The reading difficulties of many students who are deaf or hard of hearing in the United States also lead to their low writing skills. There is a reciprocal relationship between lower level (e.g., grammar, spelling punctuation, etc.) and higher level (e.g., purpose, audience, etc.) skills in writing. Access to the lower level skills requires, at the least, an understanding of phonology (and morphology) of the spoken language (or language of print). We can emphatically state that good readers have the potential to become good writers. Good writers are almost always good readers. In this sense, there is also reciprocity between reading and writing.

3. THE CHINESE WRITTEN LANGUAGE SYSTEM

The relationship among Chinese spoken and written language forms is much more complicated than that of an alphabetic language such as English. Instead of an alphabet, the Chinese orthography uses Chinese characters, which are written within imaginary square blocks. Chinese is a tonal language in which the same phonetic pronunciation with a different intonation has a different meaning. There are only 1,277 legal syllables in the Chinese language; therefore, there are many Chinese words that sound alike (i.e., words with the same phonetic pronunciation and intonation) but contain different meanings (McGuinness, 2004, 2005). A phonetic Chinese alphabet called *pinyin system* has been created to help spell out the pronunciation of words. Contrary to the misconception of Chinese as a primarily pictographic language, 81% of all modern Chinese characters are semantic-phonetic compounds consisting of a semantic element that specifies the meaning and a phonetic element that indicates the pronunciation (Mair, 1996). Only the simplest characters are entirely pictorial in origin.

The phonetic element of the Chinese written language requires an understanding of a phoneme-symbol correspondence similar to an alphabetic language such as English. Nevertheless, similar to the teaching methods used in the United States, the reading instruction for Chinese students who are deaf or hard of hearing has heavily relied on recognizing the shape of the character as a whole (i.e., whole word reading). So far, there has been no intervention research on phonemic awareness or phonics instruction for students who are deaf or hard of hearing in China (Hu, Zhang, & Yu, 2008).

Chinese is a tonal language, which makes it even more difficult for children who are deaf or hard of hearing to learn the spoken form because they cannot identify the changes in tones that significantly change the meanings of words. In Chinese Sign Language (CSL), blinks, frequently expressed as a change in gaze or a slight head turn, can be used to communicate tones for students who know CSL. For a few pictorial Chinese characters, the Chinese signs reflect the written symbols. Even though CSL has somewhat of a formal pictorial connection to the written language, CSL, by itself, is not sufficient to convey the tonal aspects of spoken Chinese. An additional visual system is needed to supplement CSL or to represent the tonal aspects.

Since the first Chinese school for the deaf was established in 1887, oral/aural rehabilitation has dominated government policy in China (Lytle, Johnson, & Yang, 2005/2006). Most schools for the deaf use oral communication supplemented by signed Chinese (Callaway, 1999, 2000; Lytle et al., 2005/2006). Signed Chinese, similar to the research on signed English in the United States, is extremely difficult for many deaf or hard of hearing students to understand. In addition, the relationship between signed Chinese and written Chinese has not been explored extensively. In any case, it can be argued that if Chinese deaf or hard of hearing students do not have adequate access to the phonology of Chinese, this will impede their literacy development.

Similar to the challenges faced by students who are deaf or hard of hearing in the United States, students in China have difficulties in decoding Chinese characters at the word level as well as in developing higher-level skills beyond the word level, partially due to the different language structures of CSL and written Chinese and partially due to the general lack of understanding of signed Chinese. It is clear that students need to develop competence in the general components (e.g., phonology, morphology, syntax, semantics, and pragmatics) of the language of print. Specifically, students need to develop adequate decoding skills so that they can spend more time on the task of comprehension (McGuinness, 2004, 2005; Pence & Justice, 2008). In short, students need to learn about the writing system of Chinese.

4. THE KOREAN WRITTEN LANGUAGE SYSTEM

The Korean writing system, which is generally known as *Hangul*, also follows the alphabetic system – that is, the written letters correspond to sounds or phonemes. Hangul maps letters onto phonemes just as English does. Use of an alphabet in Hangul is one feature that shares similarities with orthographies such as English. However, *Hangul* is nonlinear, arranged in a square-like block, in which the symbols are read left-to-right and top-to-bottom, just like Chinese. The letter-phoneme correspondences are predominantly transparent (Coulmas, 2003). However, pronunciation of some Korean graphemes is irregular and depends on context, similar to English or Chinese. Some Korean irregular words are difficult to read because they are subjected to two or more phonological changes (Coulmas, 2003).

Perfetti and Liu (2005) argued that, although Korean and English are within the same alphabetic family, there are a few differences. These differences arise from the spoken forms of the languages rather than from their orthographies. Since reading

builds on the alphabetic principle, students who are deaf or hard of hearing, as well as hearing students, need to possess phonological knowledge in Korean to understand the relationship between letters and phonemes. As we have mentioned previously, despite agreement regarding the importance of phonology in early reading development, no research has been conducted on intervention of phonics or phonemic awareness in deaf education in Korea.

In Korea, most research regarding reading of students who are deaf or hard of hearing has focused on vocabulary, syntax (Kang, 1994), or reading comprehension strategies (Won, 2001). There has been some research on phonological awareness (Choi, Ahn, & Kim, 2006), inference (Kim & Heo, 2004), metacognition (Won, 2001), and context factors. More recently, a few researchers have started to attend to the relationship between Korean Sign language (KSL) and Korean reading comprehension (Choi & Ahn, 2003). However, there are only a few studies regarding KSL or the relationship between communication modes (KSL or signed Korean) and reading comprehension.

Like deaf learners in the United States and China, most deaf students in Korea have difficulty in learning to read and write. Most deaf students at high school are reading at the fourth or fifth grade level; their writing levels are estimated to be somewhat lower. Although Korean deaf students have a delayed development in reading and language, the results of these studies indicated that they follow the same development patterns as hearing children in learning how to read (and write). That is, Korean deaf students produce errors and use strategies similar to that of hearing students.

With regard to the relationship between phonological awareness ability and reading comprehension, Choi, Ahn, and Kim (2006) reported that deaf students who were in middle and high school had an 83% phonological awareness ability level. These researchers concluded that there was a positive correlation between phonological awareness and reading comprehension. Although older deaf students in this study have adequate phonologic awareness knowledge, they still do not have adequate reading comprehension ability. Thus, reading instruction should integrate lower level skills (phonological skills and single word reading) and higher level skills (vocabulary knowledge and comprehension) to better meet the needs of struggling deaf readers.

5. CONCLUSION

Through a brief discussion of the three writing systems, we have established an explanatory framework that accounts for the current low literacy levels of students who are deaf or hard of hearing in the United States, China, and South Korea. To proceed toward reading fluency--that is, the point at which decoding becomes automatic and almost effortless and the point at which most energy can be expended on comprehending the message--children need increased experiences with print as well as deeper and more extensive growth in language variables such as vocabulary, morphology, syntax and other areas such as knowledge of topics and culture. This increase in knowledge supports the decoding process and strengthens the reciprocal

relations between decoding and reading comprehension. We have argued that failure to appropriately and adequately address the phonological component of reading instruction impacts decoding (i.e., access to words) and is one major factor that underlies the reading problems of many struggling readers. In addition, given the challenges of using the hearing or auditory mode, it is necessary to develop and continue research on the use of alternative avenues to represent the phonological component.

In sum, because of the built-in phonological structures of the written language systems, we suggest that more attention should be paid to phonological-related reading instruction for students who are deaf or hard of hearing to facilitate their access to words. Higher-level skills such as comprehension and composing also should be emphasized in literacy instruction because of the reciprocity between lower-level and higher-level skills as well as the correlation between reading and writing in each language. Finally, we call for high-quality empirical studies in identifying effective reading instruction methods for improving the reading achievement of students who are deaf or hard of hearing.

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