Developmental Reading Disorders in Japan— Prevalence, Profiles, and Possible Mechanisms

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Japan has been considered dyslexia-free because of the nature of the orthography, which consists of the visually simple kana syllabary and some thousands of visually complex, logographic kanji characters. It is true that few children struggle with learning kana, which provide consistent mappings between symbols and their pronunciation. Indeed, most children can read most of the kana by age 6. However, many Japanese children struggle with reading the kanji, which represent most of the content words in a text; in addition to their visual complexity and impoverished or nonexistent phonological information, kanji are difficult because they typically have several pronunciations and multiple meanings, depending on the context. Because kanji must be learned semantically rather than phonologically, many people believe that Japanese dyslexia is due to visuospatial rather than phonological processing impairments. We sketch the complex psycholinguistic demands of retrieving the correct pronunciations for kanji, especially in kanji compound words. Some individuals have extreme difficulty in learning the correspondences between these symbols and their sounds; whether these difficulties are visual, phonological, or both is an urgent topic for further research. After introducing Japanese orthography, we present 2 case studies. The first is a profile of a boy we observed from ages 7 to 20 years with difficulties in learning both kana and kanji. The second is a case study of using an interactive reading intervention for a fifth-grade boy with dyslexia. This program was designed to reduce decoding and fluency problems by teaching the meanings and pronunciations in phrasal context rather than in vocabulary lists. We propose that some of the dyslexias in Japanese may not be the same as any type of dyslexia that has been reported for learners of alphabetic writing systems. In addition, we emphasize the need for SLPs in Japan to establish new policies that support collaborative relationships with teachers and other professionals so that they can work in schools to identify and help children with spoken and written language problems. **Key words:** *dyslexia*, *interactive reading intervention*, *Japanese orthography*, *phonological awareness*

THIS STUDY surveys the research on the incidence and nature of reading disorders and dyslexia in Japan. Japanese reading disorders may be interesting to an international audience because the complex Japanese writing system seems to foster some difficulties that have not yet been described for alphabetic writing systems. Similar problems may exist, however, and even may be prevalent, outside of Japanese if researchers start to look for them.

We define *dyslexia* as problems with decoding written text. We note that the broad category of "reading disorders" includes dyslexia, as well as other difficulties in comprehending written materials, such as difficulty accessing the mental lexicon and other problems in getting meaning from text. Reading disorders, in turn, may be considered a subtype of language disorder, and they often co-occur with other language problems.

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The authors have indicated that they have no financial and no nonfinancial relationships to disclose.

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On the basis of the report of Makita (1968), Japan was considered free of reading disorders, including dyslexia, until the work of Stevenson, Stigler, William Lucker, and Lee (1982). Makita had reported the prevalence of dyslexia as only 0.98%, which was 10 times lower than that in Western countries. This was based on a questionnaire asking Japanese teachers to estimate the number of children with difficulty reading in their classes. Makita attributed this extremely low rate of dyslexia to the ease of learning the Japanese orthography by using the kana syllabary, which provides consistent mappings between symbols and their pronunciation. For example, か is always /ka/ and ま is always /ma/. The kana syllabary should be easier to learn than the alphabetic system of English, not only because it is (almost completely) consistent, but also because the name of each kana is the same as the sound it represents. In addition, the unit size is probably easier for children to grasp. That is, the unit is always a consonant-vowel sequence or a vowel (with the exception of three "special kana," including syllable-final n). Although the kana system is called a *syllabary*, the unit of representation is properly called a *mora*, because some Japanese syllables, like ka+i or da+n, contain two moras and are written with two kana.

On the contrary, the Japanese orthography contains thousands of kanji. These are nonphonetic, logographic characters that have several pronunciations, which must be memorized and sometimes represent multiple meanings depending on whether they are used alone or in compound words (see below for fuller explanation). Kanji are introduced gradually and start to be used heavily around fourth grade.

Stevenson et al. (1982) compared reading achievement of first- through fifth-grade children in Chinese, Japanese, and English by assessing vocabulary, reading of text, and comprehension. They found that many children struggle with reading kanji. Like Makita (1968), they found that first-grade children in Japan were better at reading text than first-grade children in America. However, the ad-vantage held by children in Japan decreased as the number of required kanji increased. By the fifth grade, children in America performed just as well as the children in Japan and China. Stevenson et al. concluded that their findings offered no support for the claim that dyslexia and RD are absent among children in Japan. Large-scale studies of children between first and sixth grades that used standardized tests (Shiba & Ishida, 2012; Uno, Wydell, Haruhara, Kaneko, & Shinya, 2009) reported that the incidence of dyslexia was 1% based on kana decoding, but about 3%–7% based on kanji. As Haynes et al. (2000) pointed out after asking classroom teachers for their estimates of dyslexia prevalence, it is likely that the prevalence of RD was affected by the measurement. That is, researchers who measured Japanese children's reading skills directly (Hirose & Hatta, 1988; Yamada & Banks, 1994) found a higher percentage (6%–7%) than the prevalence based on the teachers' reports.

It now appears that there are a few children with dyslexia/RD in each classroom and that the difficulties appear in kanji rather than kana learning, but there is disagreement about the mechanisms that might underlie such difficulties. Because kanji are more complex in shape than kana, it has been claimed that dyslexia is due to visuospatial rather than phonological processing impairments (Uno et al., 2009; Wydell & Butterworth, 1999). A related claim is that children who struggle mainly with kanji may be referred to as having "visual dyslexia" or "decreased visual processing abilities" (Morinaga, Konno, Akimoto, Ogata, & Yoda, 1998).

On the contrary, phonological involvement has been suggested in Japanese reading (see Amano, 1989, for a review; Hara, 1998; Kobayashi, Haynes, Hook, & Kato, 2005; Oishi, 1998). Mann (1986) examined relationships between phonological analysis and reading ability of kana among Japanese children and found that mora and phoneme counting ability significantly predicted speed and errors in oral reading of kana words. Japanese children with RD typically display decreased phonological awareness (PA) skills (Kato,

Oishi, Hara, & Kuru, 1998; Morinaga et al., 1998; Oishi, 1998). Poor skills in phonological analysis also have been found using kanji-compound reading tasks in children with dyslexia in fourth to sixth grades (Shiba & Ishida, 2012). The high psycholinguistic demands involved in reading kanji compounds will become apparent in the "How Japanese Orthography Evolved: History and Impact" section given later.

Another explanation for poor reading was suggested by Tanaka Welty, Hyodo, Oishi, Wise, and Snyder (2006), who studied PA, decoding skills, and reading comprehension of five Japanese children with RD between first and fifth grades. They found that all five children had low scores on PA, and that the older children had significant problems with reading comprehension rather than decoding. On the basis of the simple view of reading (Gough & Tunmer, 1986), Bishop and Snowling (2004) suggested that there are at least two types of reading disorder: (1) dyslexia, a specific difficulty with decoding print caused by the phonological possessing deficits, and (2) reading comprehension impairment, a specific difficulty with text comprehension, caused by a wide range of language-processing difficulties. Tanaka Welty et al. hypothesized that relatively few children have kana decoding difficulty, but that many children have reading comprehension problems due to general language problems. This may reflect the "Matthew effect" on poor reading of kanji (Stanovich, 1986). This refers to the possibility that those who have general language difficulties understand less of what they read, learn fewer words and concepts from their reading, and fall even further behind typically developing readers in their language abilities as they age. Similarly, those who have kanji-reading difficulties understand less, learn less, and also fall behind their peers.

To summarize, there are multiple possible explanations for dyslexia and reading difficulties in Japanese, perhaps more than in other languages, because the Japanese writing system is so complex, as we explain in the next section. Thus, there are several possible symptomatologies for dyslexia in Japanese, and detailed examination of a number of individual cases is needed to understand them. This study attempts to describe what dyslexia looks like in a case study of one Japanese child, and then reports a clinical trial of a reading intervention to further delineate the nature of Japanese dyslexia/RD.

JAPANESE ORTHOGRAPHY

How Japanese orthography evolved: History and impact

To understand reading difficulties in any language, one must understand its writing system. Japanese has a particularly complex writing system because of the influence of the Chinese language and its writing system on the Japanese language and writing system. The magnitude of this influence is comparable with that of Latin, Greek, and French on Anglo-Saxon English. However, it created even more complexity in the writing system than the contact of English with other languages, because the Chinese writing system is word-based rather than phonetically based. Some Chinese characters are simple, like 山 "mountain," but about more than 80%, like 海 "ocean," are complex. That is, they are composed of two to four or so parts, called *radicals*. One part is usually a *phonetic radical*, which is a simple character that sounds roughly like the complex one of which it is a part. The others are *semantic radicals*. That is, they are components that, when used alone, denote a word with some semantic relation to the meaning of the complex one. For example, the semantic radical in *ocean* means *water* and the semantic radical in *bridge* means *tree*. Semantic radicals are rarely iconic, so "neither the semantic nor the phonetic components . . . provide an exact indication of meaning or sound, but only give a vague approximation" (Mair 1996). In other words, both meaning and sound must be memorized; the character gives mnemonic hints, at best.

More complexity was created by the fact that Japanese and Chinese are unrelated languages that differ in virtually every linguistic aspect. At the phonological level, Japanese has fewer vowels and consonants than Chinese and has a pitch-accent system, whereas Chinese is a tone language. Also, Japanese morphemes can be quite long. In fact, words consisting of a single three-syllable morpheme are common, whereas each Chinese morpheme is exactly one syllable.

Japanese morphology (word-formation) and grammar are also very different from Chinese. Chinese has no inflectional endings; for example, Chinese uses independent words to indicate verb tense when necessary and makes new words by compounding existing ones. Most modern Chinese words are two-morpheme compounds (cf. English "bookcase," "football," "(to) babysit"). Japanese uses compounding, too, but in addition, it has morphological word endings that are used to indicate verb tenses, to make negative forms, to convert adjectives into corresponding nouns (cf. English "–ness"), and so forth. Furthermore, Japanese has case particles, such as those that mark subject and object, which Chinese does not have.

Intense cultural contact occurred between China and Japan for several hundred years starting around 600 CE. At the time, China had a fully developed writing system and rich technologies; meanwhile, the Japanese language was essentially unwritten, and the relative isolation of Japan meant that it was technologically behind China. Japan learned from all branches of Chinese literature, religion, government, and technology, importing the relevant vocabulary along with this knowledge. The Chinese-based vocabulary thus became the basis of Japanese scientific and scholarly vocabulary, just as the Latin and Greek roots, often transmitted through French, became the basis of English scientific and scholarly vocabulary. Japanese officials and scholars read and wrote Chinese; officials and courtiers (including the world's first novelist, Lady Murasaki) gradually adapted the Chinese writing system to handle the Japanese language.

The only easy part of this adaptation was using Chinese characters to represent the words borrowed from Chinese. Chinese characters also were used to represent Japanese words that had direct equivalents in Chinese (e.g., *woman*, *sun*, *mountain*). But when these were used to represent Japanese words, of course they were pronounced entirely differently; for example, mountain 山 is /ʃan/in Chinese, but /jama/ (yama) in Japanese. The pronunciation hints contained in the phonetic radicals of some of the characters were thus of no use for recalling these native Japanese pronunciations. Furthermore, no Chinese characters correspond to the word endings essential to Japanese, because Chinese has no such endings, or to the Japanese case-marking particles, which are not present in Chinese (Smith, 1996).

Eventually, some Chinese characters were adapted to represent the sounds of these grammatical morphemes, and of many other words that had no Chinese equivalents. Greatly simplified in shape, these symbols developed into the kana system, which is now the highly regular syllabary (ka, ki, ko, ke, ku, . . .) that makes up the easily learned, purely phonological part of the modern writing system. Modern kana exist in two parallel systems, with about 50 basic symbols each. Hiragana is used for native Japanese words, including the grammatical morphemes, while katakana is used for writing borrowed words, roughly like the way English uses italics for Latin *ad infinitum* or French *savoir-faire* but much more widely, and also for onomatopoeia and exclamations.

As already indicated, kanji present multiple problems to the Japanese student learning to read. Because words were introduced from different Chinese dialects and at different times, many of kanji characters acquired several different Chinese-based pronunciations in Japan. Therefore, in most cases, a kanji character has a native Japanese pronunciation and several Chinese-based pronunciations, all of which must be memorized. The Chinese-based readings usually resemble one another phonologically, but not always. For

example, for the character 人 meaning *person*, the two Chinese-based readings are pronounced /nin/ and ʤ in/; the Japanese-based reading is /hito/). Note that the number of kanji characters in a word is not related to the number of sounds in it.

Which pronunciation is to be used depends on whether the kanji is used in a compound word, and if so, which compound. One can get an idea of the challenge by imagining that in English the symbol "*" is used to symbolize the meaning *star*, but that a reader has to learn that when it is by itself it is pronounced /star/; when it is followed by the characters meaning *law*, or *sailor*, it is pronounced *astro* (as in *astronomy, astronaut*). In addition, the reader must learn that when it is followed by the letters "ar" or occurs in the letter string *con*ation* it is pronounced *stell*. Consider also that this kind of information has to be memorized for thousands of symbols, with only a vague indication of pronunciation for perhaps a quarter of the words, and that the pronunciation information holds only for their academic (i.e., Chinese-based) uses, not for their daily meanings.

How the three scripts are used in connected text

Reading Japanese requires integrating the logographic kanji and the two syllabic scripts, hiragana and katakana, as shown in Sentence A.

A. コスモスの 種が 芽を 出した

kosumosu-no	tane-ga	me-o	dashi-ta.
katakana-hiragana	kanji-hiragana	kanji-hiragana	kanji-hiragana
cosmos- Possessive	*seed-* topic marker	*shoot-* object marker	*put out-* past

The cosmos seed put up a shoot.

In Sentence A, kanji are 種 (*seed*), 芽 (shoot or bud), 出 (the root form of the verb, *put up*), hiragana are の, が, を (case particles) and し, た inflectional ending of the verb, 出, and katakana is コスモス (*cosmos*). Thus, lexical

morphemes such as nouns and the roots of verbs and adjectives (*seed, shoot, put out*) are written in kanji; word endings and case particles (possessive marker, topic marker, object marker, and past-tense ending) are written in hiragana, and loan word nouns like "cosmos" are written in katakana.

The phonetic scripts: Kana

As mentioned, each kana character represents one syllable, or more precisely, one mora. Some syllables, like [kai], are two moras long and require two kana, か /ka/ and い /i/. A few combination kana are written with two kana characters, such as chyo ちょ and kyu きゅ; these count as one mora in length because they represent complexity in the initial consonant blend rather than in the rhyme. Finally, the few "special moras," including the glottal stop/long consonant marker (っ), the long vowel marker (—), and the postvocalic nasal, do not contain vowels.

The relationship between orthography and phonology in kana is highly regular and transparent: each kana always represents the same mora of spoken Japanese (with just one very common exception: the kana that is usually pronounced /ha/ is pronounced /wa/ when it is used as the topic marker). All together, there are 104 kana characters to be learned.

Sentence A, given previously, can also be written phonetically in all hiragana, as in Sentence B.

B. こすもすの たねが めを だした。

kosumosu-no	tane-ga	me-o	dashi-ta.
cosmos- Possessive	*seed-* topic marker	*shoot-* object marker	*put out-* past

The cosmos seed put up a shoot.

Children's books are written with hiragana only; katakana are introduced in the first year of elementary school. Five-year-old children already can name 70% of the kana (Takahashi, 2001), and by age 6, when they enter elementary school, the majority of children have learned to read hiragana. Accordingly, those children with dyslexia who have difficulty in

learning to read kana can be easily identified at the first grade. They have particular difficulty in processing kana in connected writing, because Japanese does not write breaks between words: Sentence B would actually look like this: こすもすのたねがめをだした。 Yamada and Banks (1994) reported that 6% of 125 fourth graders still showed this difficulty.

Kanji and their multiple pronunciations

As they progress through school, children are exposed to text containing more kanji. The number of kanji is quite large; one needs to know as many as 3000 kanji to read newspapers and ordinary texts. Furthermore, many kanji characters are visually complex. Some words are represented by a single kanji, but the majority of lexical items are made up of two or more kanji characters. For example, the meaning of Sentence A can also be expressed with multi-kanji compounds as shown in Sentence C; this type of sentence is found in textbooks starting in 4th grade.

C. コスモスの　種子が　　発芽した。

kosumosu-no	syushi-ga	hatsuga-shita.
cosmos-Possessive	*shoot*-topic marker	*sprout*-did

The cosmos seed sprouted a shoot.

The compound kanji 種子 (syushi) has basically the same meaning as the noun 種 (tane) in sentence A. The word 発芽 hatsuga) is a noun meaning "sprout"; this noun 発芽 is combined with した the past tense form of the verb "do," する, to make a verb ("sprouted") that is equivalent to the phrase 芽を出す (putting up a shoot). Children in Japan are required to learn 1006 single kanji by the sixth grade, but the kanji compounds, whose meanings are only partially transparent, effectively triple the number of sound–meaning correspondences that have to be memorized, because of their multiple pronunciations.

Phonological involvement in reading kanji

Thanks to history, as we have emphasized, each Japanese kanji typically has two or more pronunciations; the native Japanese pronunciations are called the "KUN"-readings and the Chinese-based ones are called the "ON"-readings. The KUN-reading is usually used when a single kanji occurs in isolation or followed by kana and is also used for a small set of multi-kanji words. An ON-reading is used for most kanji compounds and, rarely, for a single kanji word (Smith, 1996). Because each kanji compound has only one correct pronunciation, when there are several ON-readings for each component character, the right pronunciation must be retrieved for each of them (remember the hypothetical English examples of *naut = astronaut, con*ation = constellation, etc.). It is true that the meaning of the kanji may be guessed without the pronunciation (because it remains relatively constant across contexts), but the child who does not remember the pronunciation will obviously be unable to recognize the word when it is used in classroom discussions or elsewhere.

Kanji compounds learned in school contain the single kanji learned earlier. In Sentence C, the kanji 種 (seed) is combined with another kanji 子 (child) and 芽 (shoot) with 発 (start). As we said previously, these previously learned kanji are pronounced in different ways when they are used in such combinations. The kanji 種 is read as /tane/ in Sentence A (its KUN-reading) but as /syu/ in Sentence C (its ON reading); and 芽 is read as /me/ in A, but /ga/ in C. These two sentences are repeated in the box later for ease of comparison:

A. コスモスの 種が　　芽を　　出した

kosumosu-no	tane-ga	me-o	dashi-ta.
katakana-hiragana	kanji-hiragana	kanji-hiragana	kanji-hiragana
cosmos-Possessive	*seed*-topic marker	*shoot*-object marker	*put out*-past

The cosmos seed put up a shoot.

C. コスモスの　種子が　　発芽した。

kosumosu-no	syushi-ga	hatsuga-shita.
cosmos- Possessive	*shoot-* topic marker	*sprout-* did

The cosmos seed sprouted a shoot.

Given the phonological processing and cognitive demand in reading kanji compounds, it is predictable that some children with dyslexia who are able to deal with kana because of their high transparency will have problems in reading kanji compounds as they are introduced around the middle of the 4th year of elementary school.

PHONOLOGICAL INVOLVEMENT IN JAPANESE DYSLEXIA

Makita (1968), the first researcher to study Japanese children with dyslexia, defined *dyslexia* as a disorder manifested by difficulty in learning to read despite conventional instruction, adequate IQ, and sociocultural opportunity. This definition has been applied in identifying children with dyslexia for clinical practice and research in Japan. Several studies have shown that Japanese children with RD typically display poor PA skills (Kato et al., 1998; Morinaga et al., 1998; Morita, Nakayama, Sato, & Maekawa, 1997; Oishi, 1998). For instance, difficulties in segmenting kana words into moras were found in 6- and 7-year-old children who were poor readers (Morita et al., 1997), and low performance in reversing the sequence of moras in kana words was reported among middle-school children with RD (Oishi, 1998). In a more systematic study, Tanaka Welty et al. (2006) obtained scores on PA, reading, writing, and reading comprehension tasks from 5 children with RD between first and fifth grades. On phonological tasks such as syllable reversal and deletion, all five children with RD had low z-scores (between -1.3 and -4.5 below the average of children with normal reading achievement), indicating that they all had severe problems with PA. Oishi, Hara, and Hi-ratani (2012) looked at the scores on PA tasks and reading speed of single nonwords written in kana for 10 children with RD (first to sixth graders). Seven of 10 children with RD had z-scores poorer than -3 on PA tasks, and their PA scores were equal to those of normally developed 4- or 5-year-old children. Because of studies such as these, Japanese speech–language pathologists are now aware that dyslexia is a language disorder with phonological involvement.

A JAPANESE CASE STUDY: ICHIRO

To show the effects of this complex writing system on an individual, we describe a longitudinal study of Japanese dyslexia by profiling a boy with severe decoding problems. We followed "Ichiro" from 7 to 20 years old.

Ichiro's early speech and language were apparently developing normally. When he started first grade; however, he had difficulties in learning kana and could not read his own name written in kana. On his teacher's advice, his family took him to an education consultation center, where he was given the Wechsler Intelligence Scale for Children–III; his Verbal IQ was 94 and Performance IQ was 111. The center's pediatric neurologist diagnosed him as having a reading disability, so Ichiro started to receive reading treatment from the third author, who was the center's SLP.

Disability in PA and kana learning

The first evaluation of PA in first grade showed Ichiro's developmental age to be 4.5 years, a 3-year delay. Ichiro could not memorize the sound of individual kana such as あ (/a/ in hiragana), even after many repetitions. Therefore, the key word teaching method for preschoolers was adopted: a key word [e.g., あり (/ari/, ant) for あ /a/] is assigned to each kana and the pronunciation of the kana is evoked by its key word. It still took a year for him to learn to decode 60 kana with this method. Even after learning how to sound out each kana, Ichiro spent several months learning how to sound out even two-mora words. Some errors in reading kana

words appeared to be caused by visual similarity; みろ (/miro/, nonword) for みち (/michi/, "road"); other errors were caused by phonological complexity; きて (/kite/, 'come') for きって (/kitte/, 'stamp'). Note that we have observed that the "special morae," such as glottal stop/long consonant っ, long vowel (—), and syllabic nasal, tend to be omitted in writing by other Japanese people with dyslexia as well.

Difficulties in kanji learning

Learning kanji was much more difficult for Ichiro than learning kana. Kanji are conventionally mastered through rote memorization (i.e., repeatedly saying aloud and writing down kanji that are extracted out of context). However, this learning method was not effective for Ichiro and apparently put a strain on him, because he started to refuse to learn kanji.

Learning the multiple readings for kanji was very difficult; therefore, Ichiro was taught only one reading per kanji and was taught only limited numbers of high-frequency kanji (e.g., 山/jama/, mountain; 川/kawa/, river). He mastered 250 kanji in the 6 years of elementary school, which would be appropriate for second grade. By age 18, Ichiro had learned the sounds for most of the fifth-grade-level kanji.

His failure to learn kanji hindered his reading comprehension, because, as noted previously, content words--the words that take the central role in conveying the meaning of the sentence—are mostly represented by kanji. Not being able to read kanji meant that the concepts represented by these kanji could not be learned from textbooks. Ichiro's grades were mostly 2 on a 5-point scale throughout elementary school, junior high school, and high school. His PA score on kana words improved over time, but it was still at the level of early elementary school at the age of 20 years, indicating that his phonological impairment was severe. However, his problem went far beyond the kana decoding difficulty; his problems with the kanji indicated that he was barely able to learn any kind of

correspondence between a symbol and a linguistic unit. Only a study analyzing the nature of his errors and confusions would be able to tell whether this was a visuospatial problem or a new kind of cognitive symbol-processing disorder, but unfortunately, such data are not available.

A PRELIMINARY STUDY OF AN INTERACTIVE INTERVENTION FOR JAPANESE RD

Any intervention should target the nature of the impairment. Based on the simple view of reading (Bishop and Snowling, 2004), Snowling and Hulme (2012) emphasized relying on a causal theory to develop intervention; it should reinforce emergent skills to be effective for dyslexic readers. Poor comprehenders require training in oral language skills, in particular vocabulary and narrative. At the same time, they pointed out that many children have problems with both decoding and comprehension. This is especially the case for older children. They also emphasized that it is good practice to ensure that interventions are systematic, well structured, and multisensory. On the basis of their work, we have developed a structured reading–language intervention approach, called the Top-down Structured Reading Language Intervention (TSRLI) program (Tanaka Welty & Iriyama, 2010; Tanaka Welty, 2012). We implemented it with an 11-year-old boy with dyslexia

The subject of this second case study was "Shin," a fifth-grade boy with no family history of language or reading disorder. His fourth-grade classroom teacher noted that Shin could not read the textbooks at his age level despite his good cognitive functioning. Shin's difficulties were mainly inability to choose the correct pronunciation for kanji. For example, he had difficulty knowing whether to read the simple kanji 方 as "kata", "ho," or "po" based on the context. This kind of problem is neither visuospatial nor phonological; it seems similar to that of English-speaking children with RD who cannot use context decide whether "teer" or "tare" is the right

pronunciation (and associated meaning) for the letter sequence t-e-a-r. Such decisions require both retrieving the possible sounds of the word (i.e., bottom-up processing) and using meaning to choose the correct one (i.e., top-down processing). Shin's reading problem had not been diagnosed in his first three school years, because he could decode kana.

Shin was referred to a resource room where the special education teachers provide traditional intervention (i.e., repetitive practice in reading texts and writing kanji three times per week for 45 min). However, he failed to respond to this intervention and refused to participate in the therapy. He also lost his interest in classroom learning. His WISC-R scores were low average but within normal limits: Verbal IQ 82, Performance IQ 92, and Full Scale IQ 85, but his academic achievements in language and math were very low. Clinically, he was diagnosed as having a learning disability, specifically dyslexia.

The TSRLI program was then introduced to Shin. Because the purpose of reading is to get the meaning out of text, one of the main targets of the TSRLI program is to promote the child's top-down strategy, which is a metacognitive strategy involved in sentence and text comprehension processing to infer and grasp the gist. The implementation started with inferencing on the basis of the pictures about the content of the text that the child is about to read, retelling of what the teacher read for him or her, followed by completing a visual map to denote the content. The rich verbal interaction between the child and the adult was intended to enhance such oral language skills as listening comprehension, narratives, and vocabulary.

Recall that content words are mostly represented by kanji, and that difficulties in character-to-sound association can occur with kanji, especially kanji compounds. Therefore, vocabulary was enhanced by explicitly teaching the pronunciations and meaning of kanji compounds, so that the child could pronounce them and understand their meaning at the same time. This training of fluency

was promoted at the phrase or sentence level rather than at the word level. For example, Shin repeated a phrase or sentence that the teacher or clinician read to him so that he could get a sense of reading fluency, which many dyslexic children do not have. We note that the intervention did not include activities of PA to promote word-level decoding, because at this point, Shin did not have problems with kana.

A teacher in the resource room, who was trained by the first author regarding the nature of dyslexia and the language-based reading approach, implemented the TSRLI program for Shin 20 min daily for 12 individual sessions (2.5 weeks), including pre- and postassessments.

As the pre- and postmeasurement scores, Shin's reading fluency was measured in decoding speed while reading a section of the textbook, plus a short untrained passage to see generalization. Shin's reading speed was dramatically shortened for both the textbook (383 letters) and the short passage (280 letters); his reading speed for the textbook at pretest was 682 s and 162 s at posttest. His reading speed for the untrained passage was 314 s at pretest and 143 s at posttest. We obtained the reading speed of eight normal fifth graders and found that the average reading speed was 103.9 s ($SD = 21.1$) for the textbook and 60.0 s ($SD = 12.8$) for the untrained passage. The increase of Shin's reading skill also was measured by the number of errors in reading. The average number of errors in reading by the eight fifth graders was 2.8 words ($SD = 1.8$ words) for the textbook. Shin misread 10 words at the pretest. After the intervention, the error in reading was one word.

His classroom teacher was the first person who noted Shin's changes in reading fluency and in his attitude toward comprehending meaning in spoken and written texts, because, after the first few sessions, he began asking her questions about the meanings of words in her instructions. As the intervention proceeded, he gained the confidence to read and understand texts and voluntarily

expanded his reading repertoire to other textbooks, such as biology and social studies texts. Although his reading speed at the postassessment was still −2SD below the mean of the fifth graders, Shin's engagement toward reading and classroom attendance were also motivated well beyond our expectation. Thus, administering the TSRLI program with the e-textbook for 20 min/day for just 2.5 weeks seemed to have good effects even on an older student with RD.

IMPLICATIONS FOR POLICY DEVELOPMENT FOR SLPs IN JAPAN

There are not enough children identified as having dyslexia to form an affected group for a comparative study to fully delineate the nature of dyslexia for Japanese. Few teachers are even aware of the concept of dyslexia/RD in Japan. Our studies indicated, however, that children with dyslexia do exist in classrooms. Some of them may struggle with kana learning from an early age. Most of them face difficulties around the third year of school in reading kanji compounds that have multiple readings, probably because of underlying phonological processing deficits. Given these dyslexia profiles, SLPs need to establish collaborative relationships with teachers and other professionals, and to play facilitative roles in assisting them to identify literacy problems of young and older children in classrooms. Speech–language pathologists can play critical roles in promoting preliteracy and literacy development of children with language disorders, who are at great risk for reading problems. Language delayed preschool children can be assessed in terms of preliteracy skills such as PA and print knowledge.

Most SLPs in Japan, however, work in hospitals and treat adult patients under the doctors' orders. Those SLPs specializing in children mainly treat language delay in preschool ages. There is no official system for SLPs to work in schools, nor are there any reading specialists. Generally, school-aged children with RD receive education through a resource room at schools and have no access to SLPs. A few such children, like Ichiro, go to education centers or hospitals and receive treatment from SLPs by decision of their parents.

CONCLUSION

Orthographies differ in many ways (Zeigler & Goswami, 2005), and the nature of the relationships between sounds and symbols affects the incidence and possibly the nature of dyslexia. Japanese is often described as a shallow script with rare dyslexia, but this is true only for the kana system; the kanji system may be the deepest orthography in the world (Morton, Sasanuma, Patterson, & Sakuma, 1992).

Although Japanese people with dyslexia who have difficulties with kana learning might be rare, they do show severe delay in PA development, indicating their underlying phonological processing deficits. Other dyslexia profiles can occur in recovering the sounds and meanings of words written with kanji, especially kanji compounds. The profile for Shin, who had a specific difficulty in choosing the contextually correct pronunciation for a given kanji from among its several possible pronunciations, was treated as a language-based disorder (RD). Even though we do not know the extent to which phonology was involved, it might, in fact, be a decoding problem, in the sense of being a specific problem with using a written symbol to get to the corresponding lexical item. If Shin indeed has a decoding problem, it may not be the same as any type of dyslexia that has been reported for learners of alphabetic writing systems.

Because kanji represent the core meaning of content words, failing in decoding kanji seriously hinders reading comprehension. Therefore, children with RD have problems in both decoding and comprehension. Hence, a specific intervention that mixes reading for decoding and language for comprehension in a structured way can be helpful. Written language problems require a collaborative approach with other professionals, and new

policy developments in both teacher and SLP education are necessary for SLPs to be integrated into Japanese schools. To demonstrate the need for such innovations, it is necessary to carry out further studies on both accurate identification and the efficacy of intervention using evidence-based practices for Japanese children with RD.

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