

Phonological Awareness as Revealed by Spelling: Do Japanese EFL learners process written English phonologically?

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Reading, of course, does not end with the recognition of visual word forms - it would be more accurate to say that it begins with this. Written language is meant to convey not only the sound of words but their meaning, and the visual word form area has intimate connections to the auditory and speech areas of the brain as well as to the intellectual and executive areas, and to the areas subserving memory and emotion. (Sacks, 2010, p. 63)

Introduction

As outlined above by Sacks (2010), reading leads to the activation of both sound and meaning in the brain. Walter (2008) makes an important distinction between the way written words are decoded and stored; decoding takes place visually and storage phonologically. Walter explains how readers of alphabetical languages process the last two seconds of what they have read. This time span of two seconds, during which listeners automatically retain what they have heard, is known as the “phonological loop” (p. 457). While reading, rather than having a visual representation of the words just read, the words are stored aurally, in the phonological loop. (p. 458)

The present study is a comparative analysis of spelling errors made by L1 speakers and Japanese L2 speakers of English. Spelling errors can provide insights into the phonological representation of English in the speaker’s mind. If, as Sacks (2010) and Walter (2008) have argued, sound is mentally activated by the reading process, the question to be addressed here is, what specific sounds are activated by the reading process? What similarities and differences are found in the phonological loops of L1 and L2 readers?

Mapping Phoneme onto Grapheme

English spelling was originally a phonological representation of the words and in Old English, before spelling was standardized, words were spelt differently according to the pronunciation of the region (Crystal, 1988, p.170).

Sacks (2010) and Walter (2008) outline how L1 readers of English process the written word as sound, a process which is evident even from the early stages when children begin to acquire L1 literacy. Before children learn the spelling conventions of standard English, they use the sound of a word as a guide:

The study of the errors children make when they are learning to spell (errors like *our* for *hour*, or *sed* for *said*) shows that spelling is not just a visual matter, but a matter of relating letters to sounds. The children spell the word as they hear it in their heads”....” We don’t learn to spell by studying the ‘shape’ of the word, and remembering that. Children who try to spell by learning visual shapes soon get into deep water.” (Crystal, 1988, p.75)

The practice of mapping letters to sounds is not limited to children learning to write their first language. There is evidence from both educators and in particular social media that speakers desire to map written conventions to pronunciation. In the USA American spelling was modified due to the desire of Webster that spelling conform more closely to pronunciation (Lynch, 2009). This tendency to represent spelling according to how it sounds, rather than conforming to etymology or traditional convention, continues to the present. Text messages are a prime example of economical spelling which conform to pronunciation rather than convention. Crystal (2008) in his book entitled ‘Txtng: The gr8 db8’ provides numerous examples of innovative spellings used in text messages. He highlights just how critical the sound of the word is when creating an invented spelling: “Before you can write abbreviated forms effectively and play with them, you need to have a sense of how the sounds of your language relate to the letters.” (2008, p. 162). Hence sound underpins spelling, whether deliberately or not, and also gives an indication of users’ perceptions of the way the words sound.

Not all agree that recognition of English writing is phonologically based: “The fact that written words are made up of letters that seem to be themselves to be related to sound is as irrelevant to their recognition as the fact that most automobiles have their model name stuck on them somewhere” (Smith, 2006, p. 32). Smith argues that just as people can recognise cars without having to read the model name badge, written words can be recognised the same way (p. 32). Furthermore Smith identifies the fact meaning rather than sound disambiguates homophones such as *there* and *their* (p. 33). Thus, spelling represents meaning rather than sound (p. 36).

However, the preponderance of homophone errors by both L1 children and L2 learners suggests that many learners take their cue from the sound of the word rather than the meaning. Perhaps the sound is the initial cue for the spelling, and after corrections by the teacher L1 and L2 writers learn to map the meaning onto the spelling as well as the sound.

Insights from the Importance of Phonemic Awareness in Learning to Read by L1 Speakers

Important features of teaching L1 reading include the use of phonics, and familiarization with rhyme and alliteration.

Phonics

Cambourne argues that phonics, in the same way as grammar and spelling, should not be taught as an isolated skill:

Teaching phonics as a separate subject, by pulling the grapho-phonetic system free from the complex web of other linguistic systems, knowledge and processes with which it interacts to construct meaning, is a common example of an inadequate demonstration.... *Thin demonstrations* do not make explicit and visible many of the invisible implicit processes and the tacit knowledge that underpin effective reading and writing. A teacher who *reads* out loud but neglects to (occasionally) *think* out loud (to make visible how she or he deals with blockages or unknown words) is demonstrating what reading can be used for (e.g. entertain or inform) but not how it's done. (2001, p. 785)

Accordingly, as the teacher reads to L1 children, knowledge of the grapho-phonetic correspondence cannot be assumed; it needs to be made explicit in order to facilitate fluent reading. Perhaps the same level of explicit teaching of the grapho-phonetic relationship needs to be applied to L2 learners as well.

Rhyme and Alliteration

Bradley and Bryans (1983) in their landmark study of learning to read English as an L1 confirmed that the link between phonological awareness and reading was causal (p. 421). They suggested that sensitivity to rhyme and alliteration was related to progress in reading skills, and that the neglect of teaching these skills could lead to delays in learning to read. In fact, phonological sensitivity is so important that sometimes children's rhymes employ rhyming at the expense of making sense (Cook, 2000, p. 46). Cook explains the role that familiarity with rhyme has with the development of literacy: "Ability with rhyme and rhythm, then, apparently an oral and aural skill, turns out to be an aid to, even a precondition, of literacy" (p. 26). Hence verse is an entry-point into the acquisition of

literacy: “Even before the initial encounter with writing the child is being primed for literacy; and verse may be part of that priming” (p. 27). Similarly, Wolf elucidates the important role played by nursery rhymes in the development of phonemic awareness: “the child who has begun to discriminate paired sounds has also begun to segment the internal parts of words into smaller components” (2008, p. 99).

Firth (1972, cited in Coltheart, 1983) distinguished between good and bad readers according to their awareness of letter-sound correspondences. Good readers relied on these letter-sound correspondences rather than the visual representation of the words. Goswami and Bryant (1990) however, indicate that there is more to reading than simply grapheme-phoneme mapping; they insist on the importance of onset and rime (p. 47). Because of the regularity of the representation of rimes by particular spellings, children learn to map onsets and rimes to letter sequences (p. 42): “The ease with which children rhyme and detect rhyme and alliteration is a good reason for treating the idea that children read new words by making analogies seriously” (p. 64). Furthermore, they argue that preschoolers tend to be more sensitive to onset and rime than individual phonemes (p. 77).

Source of Reading Difficulties by Japanese Learners

Sacks indicates that “the same reader may use somewhat different neural circuits for reading different languages” (2010, p. 70), using the example of bilingual speakers losing the reading ability in only one of their languages after a stroke. Sacks reports on Nakayama and Dehaene’s (cited in Sacks, 2010, p. 70) study of readers of L1 Japanese, who demonstrate “subtle but significant differences” (p. 70) in their recognition of *kana* and *kanji*, and rare cases of the loss of the ability to read either (but not both) *kana* or *kanji*. Morton and Sasanuma argue that the process of obtaining meaning from *kanji* “proceeds without any phonological activity” (1984, p. 38, cited in Penner, 2011, p. 24). When reading *kanji* the area for processing meaning is activated, but the area for converting the grapheme to a phoneme is not. Whereas, when reading *kana*, the area for converting the grapheme to a phoneme is activated (Sakurai, Momose, Iwata, Sudo, Ohtomo & Kanazawa, 2000, cited in Penner, 2011). From this, Penner concludes that the process of graphic to phonemic correspondence for Japanese learners of EFL is “counterintuitive and unnatural” (p. 24).

Nevertheless there are similarities of the reading process across languages despite orthographic differences. Dehaene explains:

In spite of the diversity of writing systems and transcription rules, people the world over, by and large, solicit the same brain areas when they read. Chinese characters, alphabetic strings, Hebraic letters, and Japanese *kanji* all take very similar cortical

processing routes. Furthermore, when they enter the visual cortex, all written stimuli are channeled to the left letterbox region, where they are recognized regardless of their exact shape, size and location. This package of visual information is then shuttled on one or two main routes: one that converts it into sound, the other into meaning. Both routes operate simultaneously and in parallel- one or the other gets the upper hand, depending on the word's regularity. (2009, p. 119)

Importantly, Dehaene explains that both sound and meaning are represented in all writing systems (p. 176), but confirms that the processing of *kana* and *kanji* are slightly different: "The two notations thus probably depend on different microterritories in the cortex, although all are located within the same general area" (p. 100). However, Dehaene insists that the region activated by the reading of Japanese is "essentially identical" (p. 99) to that of English.

Children learning to read L1 English exhibit individual differences. Different ways of decoding written English have been described as 'Phoenician' or 'Chinese' (Baron, 1979, & Baron & Treiman, 1980, cited in Goswami & Bryant, 1990, p. 128). Phoenician decoding is alphabetic and Chinese is logographic; the distinction being made because the Phoenicians depended on a phonological code and the Chinese a visual one. In the case of Japanese, however, children learn to read the *kana* syllabic script, which is phonological, before they learn the *kanji* logographs. Goswami and Bryant (1990) explain how *kana* is presented to children; it is ordered according to a phonemic principle. Groups of *kana* beginning with the same phoneme are ordered in sets, for example, the *kana*: *ka*, *ki*, *ku*, *ke* and *ko* are presented as a group. Goswami and Bryant (1990, p. 10) argue that this may explain the heightened sensitivity to phonemes of 10 year old Japanese children compared to Chinese readers, who only use a logographic script.

Japanese children learning to read their L1 remember the *kanji* characters not according to a phonological representation of strokes (which does not exist), but rather by repeated rote practice, until the order and direction of writing of each stroke becomes automatic. The contrasting representations of Japanese and English orthography may lead to errors if the method of remembering *kanji*, which is visual, is transferred to L1 English, which is phonological. Even in English, as Firth (1972, cited in Coltheart, 1983) outlined, good readers may be distinguished from bad readers according to whether they process the words according to letter-sound correspondences or visually. If Japanese learners of L2 English rely solely on visual learning for English words, it may inhibit their reading acquisition of English.

Takeda (2002) cites the difficulty of making letter-sound correspondence as a source of Japanese students' reading difficulties in their first three years of English study. Rather

than directly reading words, students have to rote-learn vocabulary lists, which are often pronounced according to *katakana* conventions. Takeda suggests this could be resolved with phonics instruction, in which explicit connections are made between sounds and letters.

If Takeda's assertion is true, this constitutes a major obstacle to reading acquisition: "phonological processing is a sine qua non of successful literacy development" (Goetry et al. 2009, p. 169). Goetry et al. argue that second language learners will be handicapped in their second language if the phonology and orthography of the irrelevant language (i.e. their L1) are not inhibited in the course of reading the second language. They argue that phonological coding from one writing system can be transferred to a dissimilar written system. This seems to concur with Takeda's concern that *katakana* representations are activated when students read English.

Japanese and English contrast according to the ways in which sequences of consonants and vowels appear. Japanese *mora* are expressed either as a single vowel or consonant plus vowel (C+V). Hence the mental phonological representation for speakers of Japanese is the CV pattern. In contrast, speakers of L1 English, as Goswami and Bryant (1990) have argued, tend to make a phonological representation of their language in terms of onset and rime. This could consist of an initial vowel, consonant or string of consonants in the onset, followed by combinations such as a vowel, vowel and consonant, or vowel and string of consonants. The CV pattern contrasts with onset and rime in terms of the position of the intra-word components. This difference may predict conflicting mental representations of words for Japanese learners of English.

The teaching of onset and rime for Japanese learners of English may be warranted. Furthermore, in order to heighten children's awareness of this relationship, the teaching of rhyme will be beneficial; In the case of L1 learners "the experiences which a child has with rhyme before he goes to school might have a considerable effect on his success later on in learning to read and to write" (Bradley and Bryant, 1983, p. 419). Masuhara recommends the skills acquired by L1 readers also be extended to L2 learners: "The question is whether L2 learners, even at an advanced level, possess the kind of auditory images similar to those of L1 skilled readers? If not, the reading pedagogy has to provide such intervention." (2007, p. 28). Space in the curriculum would be well invested in the teaching of not only phonics, but also extensive exposure to rhyme and alliteration in the beginning stages of learning L2 English.

A small study was carried out with the aim of identifying the subjects' mental representations of the sound of the words. This was in order to discover if the L2 learners

possessed the same auditory images as L1 speakers, and when and why the perceptions of sound over-rode the use of conventional spelling.

Method

The data consists of spelling errors made by L2 learners, and L1 speakers of English. The purpose of collecting this data was to identify the subjects' mental representations of the sound of the words.

The L2 learners were university students. Permission to use their writing for educational research was obtained, and the spelling errors were collected from both essays and isolated sentences.

The L1 speakers consisted of teenagers and one adult. The teenagers were bilingual speakers of English and Japanese who can be considered as L1 speakers of English because they function as such in the English speaking community. However they have had less instruction in English spelling conventions than their monolingual peers because they have been largely educated in Japanese schools.

Other spelling errors were deliberate misspellings collected from advertising, such as spelling based on sound rather than convention.

Results

L2 Learners - Phonological Errors

blass (brass)	enjoed (enjoyed)
tipe (type)	quicly (quickly)
bollow (borrow)	nomally (normally)
dout (doubt)	aboid (avoid)
parson (person)	Qustion (question)
together (together)	Dose (does)
futer (future)	responsivel (responsible)
achivement (achievement)	Disucussion (Discussion)
persent (percent)	math media (mass media)
Riview (Review)	grammer (grammar)
fourty (forty)	Futher (Further)
properities (properties)	Edipt (Egypt)
aillines (airlines)	devided (divided)
hellou (hello)	swallows (swallows)
bards (birds)	pigiones (pigeons)
hourse (horse)	sinbol (symbol)
	Bevers (beavers)

thirts (shirts)	servive (survive)
libraly (library)	holliday (holiday)
oder (order)	grobal (global)
poteto (potato)	proffeseor (professor)
porpose (purpose)	Monkys (Monkeys)
dilectly (directly)	
devided (divided)	

Looking at the above errors we can see they derive from two sources: L1 transfer (e.g. blass, bollow, parson), and invented spellings (e.g. tipe, dout, together, futer, achivement, persent and riview).

L2 Learners - Non-phonological Errors

longgest (longest)	bucause (because)
Freign Lecturers (Foreign Lecturers)	shaper (sharper)
wath (watch)	Fistly (Firstly)
Japaese (Japanese)	Furtherore (Furthermore)
Englih (English)	Howerver (However)
Eglish (English)	pinkiller (painkiller)
brought (drought)	attened (attended)
fruite (fruit)	naver (never)
quie (quite)	January 31th (31st)
slove (solve)	sudents (students)
bolow (blown)	dengerous (dangerous)
Japasene (Japanese)	contines (continues)
	Rosia (Russia)

L1 Speakers - Phonological Errors (teenagers, an adult, advertising)

unfogivable (unforgivable)
flaw boards (floorboards) [17 yrs]
sratched (scratched) [17 yrs]
this courses ... (causes) [17yrs]
bustop (bus stop) [adult, when typing]
pritty (pretty) [16yrs]
ribon (ribbon) [16yrs]
waste (waist) [16yrs]
therefor (therefore) [18 yrs]
conds (chords) [18 yrs]
fouth (fourth) [adult]

reverand (reverend) [18 yrs]
 there (their) [adult]
 foward (forward) [adult, typing]
 Majorie (Marjorie) [adult, addressing an envelope]
 Cheap Chewsdays [cheap Tuesday, signboard]
 Ruffit Camp [Rough it Camp, newsletter]

	L1 Errors	L2 Errors
Invented Spellings	yes	yes
Homophones	yes	yes
Alliteration	yes	no
Linking	yes	no
L1 Transfer	N/A	yes

**A comparison of errors made
 between L1 and L2 speakers of
 English**

Discussion

L2 Learners

Phoneme to Grapheme Conversion

Walter explains that L2 reading difficulties may be caused by “faulty grapheme to phoneme conversion” (2008, p. 460) and this appears to be the case for many of the errors listed in this sample. Walter explains that faulty grapheme to phoneme conversion occurs when the L2 reader applies their L1 rules to the L2. In the examples above, there are examples of romanized L1 letter equivalents being transferred to the L2, for example, bards (birds) and aboid (avoid).

Application of Inner Speech

Walter (2008) explains the function of the phonological loop, in which about two seconds of what the hearer has heard is temporarily stored in the memory. The existence of the phonological loop implies that speech is heard internally.

Errors made by L2 learners are not necessarily due to transfer; some errors are developmental, and made by both L1 speakers and L2 learners. For example irregular verbs such as ‘dug’ may be represented as ‘digged’ by both groups in their early stages of language development. These errors occur because of over-generalization of rules to irregular forms. Some other errors, which could be categorized as developmental because

they derive from the generalization of a rule, are not seen in L1 children but may persist in the case of L2 learners. For example, experienced L2 speakers of English sometimes write '31th' for '31st'. This suggests that the generalization of the rule has been applied rather than inner speech. In contrast, L1 speakers learn this expression phonologically, and this prevents them from generalizing the rule to write the number as '31th'. The regular occurrence of this error suggests a lack of phonological representation for some L2 learners.

L1 English Speakers

Crystal (2008) explains that of texting is motivated by the "desire to play" (2008, p. 110). Importantly, he points out that a good understanding of the phoneme grapheme relationship is necessary before children can experiment with texting: "Children could not be good at texting if they had not already developed considerable literacy awareness" (p. 162). This awareness is not developed in the case of invented spellings, in which children are experimenting with the phoneme-grapheme relationship. Hence errors by very young learners, such as 'brockeley' (broccoli) (Rowe & Edwards, 2001) 'Yere' (Year), 'skeairing' (scaring), 'mows' (mouse) (Clarke, 2004), are developmental errors, whereas the misspellings used when literacy awareness has developed are examples of language play.

The comparison of errors made by L1 and L2 learners of English indicates how sound may be internally represented for these speakers. The L1 misspellings consist of invented spellings by children, mistakes due to homophones, typing mistakes due to anticipation of subsequent letters, and deliberate errors used in texting or advertising. 'Errors' in texting are designed for efficiency, whereas 'errors' in advertising are designed to attract attention. For example, the sign 'Cheap Chewsdays', referring to discounted meals on Tuesdays, is an example of a misspelling designed to produce alliteration. The 'Ruffit Camp' (Rough it Camp) is an example of two words being combined to form one because of the perception of linking. All of these errors, with the exception of typing errors, have a phonological basis, supporting the premise that L1 speakers tend to rely on phoneme-grapheme correspondence.

Many of the L2 errors evidenced in this study are similarly phonological in origin. Some of them could be considered the same as children's invented spelling, such as 'persent' for 'percent'. Others are similar to L1 speakers' errors because they provide a homophone, such as 'plain' for 'plane'. Others though, reflect transfer from Japanese, such as 'paason' for 'person'. These examples support Takeda's (2002) observation that *katakana* representations are activated in the absence of phonics instruction.

There is some evidence of an absence of phonological awareness, such as the spelling of 'quetion' for 'question'. Hence it can be concluded that the inactivation of phoneme-grapheme correspondence in the reading of *kanji* identified by (Sakurai, Momose, Iwata, Sudo, Ohtomo & Kanazawa, 2000, cited in Penner, 2011) may sometimes be transferred to the writing skills, in this small sample.

This sample does suggest that features of L1 speech such as linking and alliteration are found in L1 errors but not in L2. More attention should be devoted to including these features of English in the EFL curriculum. Bradley and Bryans (1983) have suggested that the teaching of rhyme and alliteration is helpful to ensure that L1 learners of English learn to read, because of the causal link between phonological awareness and reading, but rhyme and alliteration receive scant attention in the English curriculum in Japan. If, as Bradley and Bryans suggest, awareness of rhyme and alliteration are critical for L1 learners in learning to read, can L2 learners of English afford to neglect it?

Recommendations of ways to improve phonological awareness for L2 learners of English

1. Rhyme and alliteration be presented in early English education

Before Japanese students formally begin to read and write English they should be familiar with rhyme and alliteration. This is a common technique in L1 English classrooms, and the advantages of learning to recognize sound patterns to facilitate literacy should be shared with L2 learners.

2. Phonics should be taught from the earliest stages of literacy, to deter students from relying on *katakana* representations of English. Attention should be drawn to onset and rime, and children should be made aware of the difference between this and the typical CV representation of *kana*.

3. Reading of English should always be accompanied by simultaneous listening (Stephens, 2011), at least until a threshold of proficiency is established. This will reinforce the notion that English orthography has a phonological representation which can be identified by analogies used when applying onset and rime.

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