CHAPTER 14

Cross-linguistic interactions in L2 word meaning inference in English as a foreign language

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L2 reading entails a complex cross-linguistic interaction between L1 reading ability and L2 linguistic knowledge. As such, it is seen as a dynamic process of coalescing diverse resources, including cognitive skills, linguistic knowledge, and metalinguistic awareness, in two languages. In this chapter, we explain the nature of morphological awareness as an abstract, yet language-dependent, construct. We then analyze systematic variations in grapheme-morpheme relationships in typologically different languages. Based on the analysis, we propose specific predictions regarding the joint contributions of L1 reading and L2 resources to the development and utilization of L2 morphological awareness. We report a summary of a study addressing the relative contributions of L1 reading ability, L2 morphological awareness and L2 linguistic knowledge to L2 word meaning inference.

Keywords: cross-linguistic interaction, L1 influence, L2 proficiency, word meaning inference, morphological awareness, L2 knowledge

As a process of text meaning construction, reading heavily relies on knowledge of word meanings. It entails retrieving word meanings from memory and integrating them into a coherent message intended by the author. Successful comprehension demands both effortless access to the meaning of familiar words and the ability to infer the meaning of unfamiliar words through word form analysis. Metalinguistic awareness, an explicit representation of the abstract structure of language, provides vital assistance in word form analysis. As abstract insight, metalinguistic awareness enables readers to segment a familiar word into its phonological and morphological constituents, and in so doing, allows them to identify familiar sub-lexical elements in the unfamiliar word and use them to infer its pronunciation and meaning (Ehri, 2014). Metalinguistic awareness emerges through detecting and

DOI 10.1075/bpa.7.14kod

abstracting structural regularities of words implicit in linguistic input. Once sufficient abstraction is achieved, metalinguistic awareness serves as a powerful tool for "self-teaching" words during reading (e.g., Share, 2008).

Over the past two decades, metalinguistic awareness has attracted considerable attention among second language (L2) reading researchers. As an abstract representation, metalinguistic awareness is distinct from linguistic knowledge in that it is relatively independent of surface form variation. In principle, therefore, once formed in one language, metalinguistic awareness is serviceable in another language as a cross-linguistically sharable resource. A central question is to what extent first language (L1) metalinguistic awareness facilitates L2 word reading and learning. A large number of studies have investigated the utility of L1 phonological awareness in L2 reading development. The cumulative evidence suggests that L1 phonological awareness makes intra-lingual and inter-lingual contributions to L2 word reading in bilingual children learning to read two languages; that phonological awareness is systematically related between two alphabetic languages; and that the utility of L1 phonological awareness is relatively unaffected by L2 proficiency (Abu-Rabia, 1995; Da Fontoura & Siegel, 1995; Durgunoglu, Nagy, & Hancin, 1993; Geva & Siegel, 2000; Gholamain & Geva, 1999; Wade-Woolley & Geva, 2000; Wang, Perfetti, & Liu, 2005).

Of late, interest in morphological awareness is escalating. As the smallest functioning unit of a language, morphemes convey rule-governed grammatical information and arbitrarily assigned functional information. Morphological awareness, as their abstract representation, comprises, at the minimum, the internal structure of words, rules of morpheme concatenation, and functional constraints on the concatenation rules. Morphological awareness is more varied and language-specific and as such, less independent of linguistic knowledge than phonological awareness. The linguistic dependency makes morphological awareness harder to acquire and more susceptible to language-specific formal variation. A clear implication for L2 reading development is that the utility of L1 morphological awareness is constrained by both L2 linguistic knowledge and structural similarity between two languages. To clarify the linguistic dependency of morphological awareness and its implication, the sections that follow describe (a) the role of morphological awareness in reading acquisition, (b) cross-linguistic variation, (c) the mechanisms of cross-linguistic sharing, and (d) the utility of L1 morphological awareness in L2 reading development.

Morphological awareness and reading acquisition

Word reading entails grapheme-phoneme-morpheme mappings. In learning to read, children rely on emerging sensitivity to a word's internal structure to figure out how phonemes and morphemes are mapped onto the graphic symbols that encode them (Ehri, 2014; Frost, 2012; Nunes & Bryant 2006). Each instance of word reading contributes to the formation of a representation of a word in memory. Durable and complete representations of words allow children to read them instantly and effortlessly from memory (Share, 2008). Morphological awareness plays a significant role in grapheme-morpheme mappings in unfamiliar word reading. Through its capacity for word segmentation, morphological awareness enables children to infer the sound and meaning of an unfamiliar word based on the information supplied by its morphological constituents. Morphological decomposition is particularly critical in later stages of reading development in which knowledge acquisition occurs through reading and word learning. Because most of the words children learn in the "reading to learn" stages are multi-morphemic, the ability to use morphological awareness for word form analysis during reading is a reliable predictor of successful reading achievement (Ehri, 2014; Ku & Anderson, 2003).

Morphological awareness develops gradually over time as its diverse facets mature at disparate rates following their own timetables. English-speaking children, for example, are sensitized to inflectional morphemes in structurally transparent words well before schooling (Berko, 1958; Carlisle, 2003), but the productive use of such sensitivity does not occur until Grades 2 or 3 (Bear, Invernizzi, Templeton, & Johnston, 1996). The awareness of derivational morphemes develops over a longer period of time – between Grades 4 and 8 (Tyler & Nagy, 1989, 1990; Ku & Anderson, 2003). Studies have shown that morphological awareness is a reliable indicator of reading ability. Skilled readers, for example, are more sensitive to a word's morphological structure than less skilled readers (e.g., Chilant & Caramazza, 1995; Fowler & Liberman, 1995; Stolz & Feldman, 1995; Taft, 1991, 1994; Taft & Zhu, 1991, 1995). Children with poor reading ability commit far more errors of affix omissions in their writing and speaking (e.g., Duques, 1989; Rubin, 1991). Children's ability to spell inflectional morphemes is a reliable predictor of their ability to infer the meaning of morphologically complex words (Nunes, Bryant, & Bindman, 2006). The efficient use of morphological information, moreover, distinguishes competent and less competent high-school readers (e.g., Tyler & Nagy, 1989, 1990). Thus, in short, morphological awareness is a critical component of reading that supports word recognition, word meaning inference, and text comprehension.

Cross-linguistic variation in morphological awareness

Morphological awareness reflects the grapheme-phoneme-morpheme relationships in a particular writing system. For example, the English orthography is alphabetic in nature, and generally bound by phonemic constraints. However, its strong tendency to preserve morphological information allows phonemic constituents to account for its orthographic conventions only partially. As an illustration, distinct orthographic patterns are used to differentiate two unrelated morphemes sharing the same pronunciation, such as "sale" and "sail." Conversely, shared morphemes are spelled identically despite their distinct pronunciations, as in "anxious/anxiety" and "electric/electricity," or the past tense marker "-ed" (e.g., /-d/ in *moved*, /-t/ in *talked*, /-ɪd/ in *visited*).

In contrast, Hebrew is a root-derived language and a word's base is a root morpheme. Root morphemes generally consist of three consonants (e.g., *gdl*) that convey abstract semantic information (e.g., "largeness"). Hebrew words are formed by intertwining root morphemes with word-pattern morphemes. Each word-pattern morpheme comprises built-in slots for the root's consonants to fit into. The Hebrew orthography encodes root morphemes, certain vowels (represented by letters that can also stand for consonants), as well as consonants that appear in patterns, prefixes, and suffixes. Reflecting the grapheme-morpheme-consonant linkages, children learning to read Hebrew are known to develop strong sensitivity to consonants (Geva, 2008; Tolchinsky & Teberosky, 1998). In contrast, studies involving skilled readers have shown that lexical knowledge and sensitivity to the morphological structure are strong predictors of word recognition efficiency (Feldman, Frost, & Pnini 1995; Frost, 2012; Frost, Katz, & Bentin, 1987). These findings suggest that Hebrew readers rely on solid lexical representations and metalinguistic structural understanding when supplying the unspecified information in graphemes during print word recognition.

In morphosyllabic Chinese, most characters map directly onto morphemes. The vast majority of characters (80 to 90%) are composite characters consisting of two graphic components called radicals. While a phonetic radical indicates the pronunciation of its character, a semantic radical conveys the semantic category of its character's meaning. Thus, in Chinese, morphological information is encoded by both a character and its semantic radical. Because of this dual-level encoding, character recognition entails information retrieval both at the character and radical levels. Research has shown that skilled readers are capable of such parallel information processing during character recognition (Taft & Zhu, 1995; Zhou & Marslen-Wilson, 1994). Although radical information is insufficient for character meaning retrieval, studies demonstrate that Chinese readers draw on semantic radical information when encountering an unfamiliar character in context (e.g., Ku & Anderson, 2003; Shu, Anderson, & Zhang, 1995).

In addition, Chinese word formation heavily relies on lexical compounding. According to the Dictionary of Usage Frequency of Modern Chinese Words (Beijing Language Institute, 1986), roughly 80% of Chinese words are compounds consisting of two or more characters. The formation of multi-character compound words is bound to certain concatenation rules. For example, in the two-character word 猪肉 (pork), the first character 猪 (pig) modifies the second character 肉 (meat). It has been reported that frequency of the component characters in a compound word affects recognition speed and accuracy among native Chinese readers (Zhang & Peng, 1992) and Chinese-English bilinguals (Wang, Lin & Gao, 2010). Recent studies have shown that a grasp of the semantic relationship between the component characters in a compound word is a significant predictor of word knowledge development (Chen, Hao, Geva, Zhu, & Shu, 2009; Liu & McBride-Chang, 2010). Collectively, these findings suggest that word reading and learning entail morphological decomposition, and that morphological awareness plays a central role in reading and word knowledge development in Chinese.

Viewed as a whole, studies involving readers of diverse languages demonstrate that morphological awareness is highly language-specific, reflecting the grapheme-morpheme relationships in the language in which reading is learned. Yet, morphological awareness plays an equally central role in word reading and learning in typologically diverse languages.

Cross-linguistic sharing of metalinguistic awareness

Recent psycholinguistic theories hold that linguistic knowledge emerges from abstracting structural regularities that are implicit in input (Ellis, 2002; Tomasello, 2003). In this view of learning, language is seen as a set of relations between forms and functions (Van Valin, 1991), and its acquisition as the internalization of those relationships through cumulative experience of mappings between corresponding forms and functions (MacWhinney & Bates, 1989). The more frequently a particular pattern of mappings is experienced, the stronger the links holding the corresponding elements together. Learning thus involves a gradual transition from deliberate execution to effortless access to emerging representations of the form-function relationships in memory. The internalization of a particular form-function relationship can be recognized as such when the activation of the mapping it entails becomes automated (Logan, 1988).

Under this view of learning, cross-linguistic sharing can be conceptualized as automatic activation of *previously established* (L1) mapping patterns triggered by language input in a *later acquired* (L2) language (Koda, 2007). L1 mapping occurs regardless of the learner's intent (non-volitional), and its occurrence cannot be easily controlled (non-selective). The conceptualization presupposes that L2 mappings emerge from cross-linguistic interactions between automatically activated L1 mappings and L2 linguistic input, that the shared patterns continue to evolve through mapping experience in the target language, and that the resulting L2 form-function relationships reflect both L1 and L2 structural properties.

By extending this line of reasoning, emergence of L2 morphological awareness can be seen as a result of continual adjustments on automatically activated L1 morphological awareness to accommodate the properties of morphemes specific to the target language. Given the linguistic dependency of morphological awareness, it can be hypothesized that the utility of L1 morphological awareness and other reading subskills in L2 word reading and learning is determined in part by similarities between two languages, as well as by knowledge of L2-specific morphological and other linguistic properties.

Morphological awareness in L2 reading development

In recent years, considerable attention has been given to the utility of L1 morphological awareness in L2 reading development. A growing body of research has examined the contribution of L1 morphological awareness to L2 reading subskills, including decoding (Geva & Wang, 2001; Ramirez, Chen, Geva, & Kiefer, 2010; Wang, Ko, & Choi, 2009), vocabulary knowledge (Chen, Ramirez, Luo, & Ku, 2012; Kieffer & Lesaux, 2012), word meaning inference (Zhang, 2010; Zhang & Koda, 2012), and reading comprehension (Jeon, 2011; Koda, Lu, & Zhang, 2013; Lam, Chen, Geva, Luo, & Li, 2012; Wang et al., 2009; Zhang & Koda, 2013).

Reflecting the complexity of the construct, the findings are not always consistent. For example, some studies found significant intra-lingual effects of morphological awareness only on decoding speed (Marcolini, Traficante, Zoccolotti, & Burani, 2011), while others have shown its contributions to both decoding speed and accuracy when whole word frequency and sub-lexical morpheme frequency were controlled (Verhoeven & Schreuder, 2011). In examining cross-linguistic effects of morphological awareness, Ramirez et al. (2010) demonstrated a significant direct contribution of L1 morphological awareness to L2 word reading in L1 dominant Spanish-English bilingual children. It is less than certain to what extent such cross-linguistic contributions of morphological awareness can be generalized to other bilingual groups whose literacy learning involve two typologically distinct languages and writing systems.

Zhang (2010), for example, investigated the relative shareability of two-word formation processes (derivation and compounding) in Grade 6 Mandarin speaking children learning English as a foreign language in China. His data revealed that the two facets of morphological awareness were differentially related between the two languages. Their cross-linguistic relationship was stronger in compound awareness (used in both languages) than derivational awareness (dominant in L2). He also found that L1 compound awareness contributed to L2 lexical inferencing only indirectly through L2 compound awareness and L1 lexical inferencing ability, but such (indirect, yet significant) facilitation was not observable in L1 derivational awareness. His findings seem to suggest that the shareability of morphological awareness and the resulting cross-linguistic contributions vary across distinct awareness facets.

To summarize, previous research has shown (1) that morphological awareness plays a critical role in word reading and learning; (2) that it emerges from experience of decoding and encoding morphemes in print; and (3) that L2 morphological awareness emerges from continual cross-linguistic interactions between L1 morphological awareness and L2 linguistic input. Given the linguistic dependency of morphological awareness, it is critical to explore how L2 linguistic knowledge affects the utility of L2 morphological awareness in L2 reading development. The sections that follow describe a summary of a study directly testing the hypothesized effect of L2 linguistic knowledge on the formation of L2 morphological awareness and its utility in word meaning inference.

The study

This study aimed to investigate the role of L2 morphological awareness in relation to L1 reading ability and L2 linguistic knowledge as they contributed to L2 word meaning inference among L1 Japanese learners of English as a foreign language (EFL). In addition, it explored how differing levels of L2 linguistic knowledge impacted these relationships. The study had the following research questions:

1. Do L1 Japanese EFL learners' L1 reading ability and L2 linguistic knowledge contribute directly to L2 word meaning inference, or are they mediated by L2 morphological awareness?
2. Does learners' degree of L2 linguistic knowledge affect the relationships among L1 reading ability, L2 linguistic knowledge, and L2 morphological awareness as they contribute to L2 word meaning inference?

Method

Setting and participants

Data for the study were collected at a mid-sized (approximately 6,000 students) private university in central Japan. In total, 182 EFL learners participated in the research. The majority of the participants (170) were majoring in English, while 12 were majoring in Chinese. All participants were enrolled in EFL classes at the time of the study. There were 92 females and 85 males, while 5 did not report their gender. Most participants were in their first year (n = 90) or second year (n = 40) of university, and the average age was 19.7 years (SD = 1.47). Most had begun formal EFL learning in junior high school (grade 7), and at the time of the study, had been studying EFL for approximately 8 years.

Instruments

L2 morphological awareness. In the present study, morphological awareness was defined as the ability to segment words into their constituent morphemes. Participants completed a morpheme counting task consisting of 60 items, including 9 monomorphemic words, 9 words with inflectional morphology (3 plural, 3 past tense, and 3 continuous aspect), 5 with compound morphology, 16 with low-transparency derivational morphology (with orthographic shifts), and 21 with high-transparency derivational morphology (without orthographic shifts). Because this measure sought to tap morphological awareness rather than tacit knowledge of morphemes, only high-frequency affixes were used, based on Blevins (2001, cited in Kieffer & Lesaux, 2007), Stahl and Shiel (1992), and Wurm (1997, 2000). Furthermore, a pilot study was conducted with 34 L1 Japanese university EFL learners who did not participate in the main study and participants' English instructors were consulted to confirm that affixes should be known to participants. The words were projected onto a screen, and participants had five seconds to mark the number of morphemes in each word. The reliability (Cronbach's alpha) was .81.

L2 linguistic knowledge. Linguistic knowledge was operationalized as vocabulary breadth and grammar knowledge. L2 vocabulary breadth was measured using an adaptation of Schmitt, Schmitt, and Clapham's (2001) version of the Vocabulary Levels Test (VLT). The VLT is made up of a series of three-item groups, containing three target words/phrases. Participants then choose from among six choices the three words that best match the target words/phrases. Because words are presented without contextual clues, the VLT is thought to be a purer measure of vocabulary breadth than tasks that present words in context. The present study made use of a shortened version of the VLT by Shiotsu (2003; Shiotsu & Weir, 2007), who trialed the task extensively with L1 Japanese university students similar to the participants in the present study, resulting in a smaller set of items with a high degree of reliability. This version of the test has 60 items and participants were given 10 minutes to complete the test. Cronbach's alpha was .89. L2 grammar knowledge was measured using a multiple-choice test from Shiotsu and Weir (2007). In that study, a grammar test was developed which reduced confounds with other reading-related constructs by minimizing the degree of meaning extraction necessary. Shiotsu and Weir's (2007) 35-item test was trialed extensively with L2 English learners in the UK and evaluated by 10 experts in applied linguistics and 20 ESL teachers. In the present study, Shiotsu and Weir's test was further reduced to 25 items by removing 10 items that showed low discrimination in a pilot study conducted with 45 L1 Japanese university EFL students who did not participate in the present study. Cronbach's alpha was .60. A composite L2 linguistic knowledge score was calculated for each participant using *z*-scores from the vocabulary and grammar measures.

L1 reading ability. Participants' L1 Japanese reading ability was measured using a rational cloze task (Yamashita, 2003). In this task, participants read an expository text, an excerpt from the book *Joho no Nawabari Riron* (Territory of Information; Kamio, 1990). The excerpt was 957 characters in length, and there were 30 blanks in the cloze task (approximately 3% of the text). All target items were content words (as recommended by Koda, 2005). Participants were given a word bank containing the 30 words that had been removed from the text, with an additional 20 filler words. To increase reliability, the task was piloted with a group of 45 L1 Japanese university EFL learners who did not participate in the study, and items that showed the least discrimination were eliminated. Cronbach's alpha was .73.

L2 word meaning inference. In the present study, L2 word meaning inference was defined as making appropriate guesses as to the meanings of unknown morphologically complex words through integration of word-internal morphological information and word-external contextual information (see also Brusnighan & Folk, 2012; Hamada, 2014). Participants were presented with 16 short texts (mean length = 132 words, *SD* = 32.17, range: 92–216), each of which contained two unknown words which were underlined (32 items in total). Participants were instructed to read the texts for comprehension, and comprehension was confirmed using comprehension question after each text. The unknown words were constructed from pseudo-word roots that were five characters in length and followed English graphotactics, to which real derivational prefixes and suffixes were added. High frequency affixes were used (see above, in the description of the morphological awareness task, for how these were determined). For each of the unknown words, participants were asked to choose the best meaning from among four choices, one which incorporated contextual but not morphological information, one which incorporated morphological but not contextual information, one which incorporated both morphological and contextual information, and one which incorporated neither (see Mori & Nagy, 1999 and Zhang, 2015 for similar tasks measuring L2 word meaning inference in Japanese and Chinese, respectively). Cronbach's alpha was .71.

Analysis

The data were analyzed using SPSS v.21 to calculate means and standard deviations of all variables and correlations among them. Then, recursive path analysis (Wolfle, 1980) was conducted using AMOS v.21 in order to determine direct and indirect effects. Together with path analysis, bootstrapping was also performed. Bootstrapping is a data-based simulation method that produces a large number of samples (1000) using replacement data, and parameter estimates are computed for each sample. Bootstrapping avoids potential issues arising from non-normal data and also provides more stable estimates of path coefficients (Schumacker & Lomax, 2010). In addition, bootstrapping allows significance testing of indirect effects by providing a distribution for these indirect effects. In order to retain power, bias-corrected bootstrapping was used, as suggested by Hayes and Scharkow (2013).

Results

Examining the collected data, 15 participants' data was found to be incomplete, and 10 participants reported speaking a language other than Japanese at home. These participants' data were removed from the dataset, leaving a final sample of 157 participants. Table 1 shows descriptive statistics of the raw scores and bivariate correlations between each of the variables. All variables significantly and positively correlated with all other variables, except for the correlation between L1 reading and L2 grammar knowledge ($p = .05$).

Table 1. Descriptive statistics and bivariate correlations

	1	2	3	4	5	M	SD
1. L2 MA	–					41.96	6.68
2. L2 V	.390**	–				21.33	9.24
3. L2 G	.267**	.465**	–			10.37	3.51
4. L1 R	.371**	.247**	.157†	–		7.14	3.28
5. L2 INF	.217**	.595**	.338**	.189*	–	10.01	4.48

Note: *MA* morphological awareness, *V* vocabulary knowledge, *G* grammar knowledge, *R* reading ability, *INF* word meaning inference.
† $p = .05$, * $p < .05$, ** $p < .01$

To answer the first research question, about effects of L1 reading ability and L2 linguistic knowledge on L2 word meaning inference, both directly and mediated by L2 morphological awareness, a path model was constructed. After optimizing the model by removing non-significant paths, the model showed good fit, χ^2 (2, N = 157) = 0.475, p = .788 (CFI = 1.000; $RMSEA$ = .000, 90% CI = .000, .102). Overall, the path model predicted approximately 35% of the variance in L2 word meaning inference.

Table 2 shows all direct and indirect parameter estimates. There was a significant direct effect of L2 linguistic knowledge on L2 word meaning inference (β = .573, z = 7.494, p < .001). However, the direct effect of L1 reading on L2 word meaning inference was non-significant (β = .040, z = 0.578, p = .563), as was the effect of L2 morphological awareness (β = .015, z = 0.190, p = .850). Because of the lack of a significant effect of L2 morphological awareness, the indirect effects of L1 reading and L2 linguistic knowledge on L2 word meaning inference were also non-significant (β = .004, z = 0.172, p = .817 and β = .007, z = 0.200, p = .789, respectively).

Table 2. Parameter estimates between L2 morphological awareness, L2 linguistic knowledge, L1 reading, and L2 word meaning inference

Paths		**Direct effects**				**Indirect effects**		
		β	z	p	R^2	β	z	p
L2 MA					.348			
	← L1 R	.257	3.848	< .001		–	–	–
	← L2 LK	.470	7.044	< .001		–	–	–
L2 INF					.351			
	← L1 R	.040	0.578	.563		.004	0.172	.817
	← L2 LK	.573	7.494	< .001		.007	0.200	.789
	← L2 MA	.015	0.190	.850		–	–	–
L1 R								
	↔ L2 LK	.250	3.030	.002		–	–	–

Note: MA morphological analysis, *R* reading ability, *LK* linguistic knowledge, *INF* word meaning inference

The second research question asked whether L2 linguistic knowledge moderated the relationships among L1 reading ability, L2 morphological awareness, and L2 word meaning inference. To answer this question, multiple-group path analysis was conducted. Participants were divided into a higher L2 linguistic knowledge group (n = 72) and a lower L2 linguistic knowledge group (n = 85) based on z-scores, and the path models of the two groups were compared.

Table 3 shows the parameter estimates for the lower L2 linguistic knowledge group. Together, the variables predicted only 9.3% of the variance in L2 word meaning inference. The results were similar to those for the whole group, with L2 linguistic knowledge showing a significant and positive direct effect on L2 word meaning inference ($\beta = .276$, $z = 2.402$, $p = .031$) and the direct effect of L1 reading being non-significant ($\beta = .101$, $z = 0.909$, $p = .363$).

In addition, there was a significant negative effect of L2 morphological awareness on L2 word meaning inference ($\beta = -.251$, $z = -2.151$, $p = .016$); as a result, the indirect contributions of L1 reading and L2 linguistic knowledge through L2 morphological awareness were also negative ($\beta = -.060$, $z = -1.428$, $p = .040$ and $\beta = -.084$, $z = -1.633$, $p = .022$, respectively). Thus, the results for the lower L2 linguistic knowledge group indicate that although there was a cross-linguistic effect (as shown by the significant positive effect of L1 reading on L2 morphological awareness), lower L2 linguistic knowledge might have prevented the utilization of these skills for L2 word meaning inference.

Table 3. Parameter estimates for the lower L2 linguistic knowledge group ($n = 85$)

Paths		Direct effects				Indirect effects		
		β	z	p	R^2	β	z	p
L2 MA					.210			
	← L1 R	.237	2.357	.018		–	–	–
	← L2 LK	.334	3.315	< .001		–	–	–
L2 INF					.093			
	← L1 R	.101	0.909	.363		−.060	−1.428	.040
	← L2 LK	.276	2.402	.031		−.084	−1.633	.022
	← L2 MA	−.251	−2.151	.016		–	–	–
L1 R								
	↔ L2 LK	.267	2.195	.018		–	–	–

Note: MA morphological analysis, *R* reading ability, *LK* linguistic knowledge, *INF* word meaning inference

The direct and indirect parameter estimates for the higher L2 linguistic knowledge group are presented in Table 4. Among the higher L2 linguistic knowledge group, the model predicted 36% of the variance in L2 word meaning inference.

Similar to the lower L2 linguistic knowledge group, the direct effect of L2 linguistic knowledge on L2 word meaning inference was positive and significant ($\beta = .449$, $z = 4.389$, $p < .001$), and the direct effect of L1 reading was non-significant ($\beta = .015$, $z = 0.147$, $p = .883$).

However, different from the previous analyses, L2 morphological awareness had a significant positive effect on L2 word meaning inference ($\beta = .257$, $z = 2.369$, $p = .018$). Furthermore, both L1 reading and L2 linguistic knowledge had significant positive indirect effects on L2 word meaning inference through their contributions to L2 morphological awareness ($\beta = .081$, $z = 2.000$, $p = .007$ and $\beta = .083$,

Table 4. Parameter estimates for the higher L2 linguistic knowledge group (n = 72)

Paths		Direct effects				Indirect effects		
		β	z	p	R^2	β	z	p
L2 MA					.230			
	← L1 R	.316	3.004	.003		–	–	–
	← L2 LK	.323	3.074	.002		–	–	–
L2 INF					.356			
	← L1 R	.015	0.147	.883		.081	2.000	.007
	← L2 LK	.449	4.389	< .001		.083	2.091	.004
	← L2 MA	.257	2.369	.018		–	–	–
L1 R								
	↔ L2 LK	.126	1.056	.291		–	–	–

Note: MA morphological analysis, *R* reading ability, *LK* linguistic knowledge, *INF* word meaning inference

z = 2.091, p = .004, respectively). These findings suggest that, different from the lower L2 linguistic knowledge group, among the higher L2 linguistic knowledge group, L2 morphological analysis had a significant positive effect on L2 word meaning inference, and this effect allowed transferred L1 reading skills to impact L2 word meaning inference indirectly through their contribution to L2 morphological awareness.

Figure 1 shows a schematic of the relationships among the variables for both the lower and higher L2 linguistic knowledge groups. Taken together, the results suggest that L1 reading competencies consistently impacted L2 morphological awareness. However, without a requisite level of L2 linguistic knowledge, these transferred competencies could not be utilized for L2 word meaning inference.

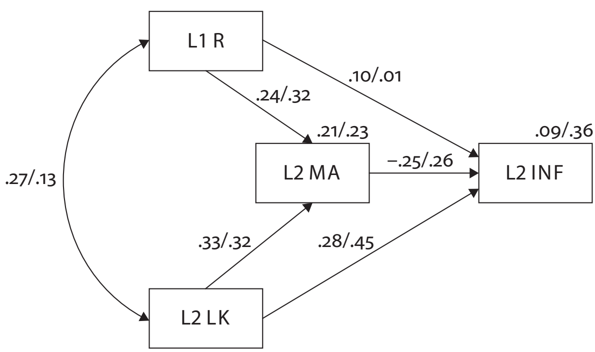

Figure 1. A schematic diagram of the results. Numbers on the left are the parameter estimates for the lower L2 linguistic knowledge group; numbers on the right are estimates for the higher L2 linguistic knowledge group

Discussion

This study investigated relationships among L1 reading ability, L2 morphological awareness, and L2 linguistic knowledge as they contribute to L2 word meaning inference among L1 Japanese EFL learners. To do this, we made use of recursive path analysis in order to investigate both direct and indirect effects. Overall, the results showed a coalescence of reading sub-skills, both within and across languages, in their contributions to L2 word meaning inference.

The first research question asked whether the contributions of L1 reading ability and L2 linguistic knowledge to L2 word meaning inference were direct effects, or whether they were mediated by L2 morphological awareness. The results from the full sample found only a direct effect of L2 linguistic knowledge on L2 word meaning inference, and neither a direct nor an indirect effect of L1 reading ability. However, L1 reading ability was found to be a significant predictor of L2 morphological awareness. The finding that contributions of L2 linguistic knowledge to L2 reading outcomes (in this case, word meaning inference) were greater than the contributions of L1 reading mirrors a number of previous studies that have investigated similar variables, particularly in EFL contexts (e.g., Haynes & Carr, 1990; Lee & Schallert, 1997; Yamashita & Shiotsu, 2017), as well as Jeon and Yamashita's (2014) meta-analysis, which showed that components related to L2 linguistic knowledge accounted for L2 reading more than L1 reading did.

However, we did see a consistent and strong positive contribution of L1 reading to L2 morphological awareness. This is consistent with previous studies of cross-linguistic transfer of reading subskills, particularly morphological awareness (e.g., Jeon, 2011; Lam, Chen, Geva, Luo, & Li, 2012; Zhang & Koda, 2012). In the present study, L1 reading had a considerably stronger relationship with L2 morphological awareness than with any other variables, as shown in the bivariate correlations ($r = .371$, $p < .01$, all other $rs < .247$) and in the positive significant direct effects across all of the path models, suggesting that morphological awareness may be a shareable resource across the two languages. This finding is interesting especially in light of the substantial differences in morphological structure between Japanese and English, suggesting that morphological awareness may be a shareable resource even among typologically disparate languages. The full mediation of L1 reading by L2 morphological awareness is especially interesting in the present study in light of the task used to measure L1 reading, a gap-filling task, which could be expected to have more similarity with word meaning inference. Nonetheless, L1 reading most strongly contributed to L2 morphological awareness.

The findings also demonstrate that although morphological awareness may be shareable across languages, there is nonetheless a degree of linguistic knowledge required in order to make use of this shared resource. As described earlier, morphological awareness is less independent of linguistic knowledge than other types of metalinguistic awareness, such as phonological awareness. The comparison in the present study of participants with differing degrees of L2 linguistic knowledge showed that utilization of morphological awareness (and the transferred L1 competencies) for word meaning inference was dependent upon L2 linguistic knowledge. That is, without a requisite amount of L2 linguistic knowledge, the L2 learners were unable to make use of their morphological awareness for word meaning inference, even though morphological awareness still received significant contributions from L1 reading ability and L2 linguistic knowledge. This result is similar to those of previous studies that suggested that a threshold level of L2 linguistic knowledge is necessary for making use of L1 reading skills, or, alternatively, that a lack of L2 linguistic knowledge short-circuits the use of L1 reading skills for L2 reading (e.g., Bernhardt, 2005; Bernhardt & Kamil, 1995; Clarke,, 1980; Cummins, 2000; Lee & Schallert, 1997; Yamashita & Shiotsu, 2017). In the present study, it was found that L2 linguistic knowledge might constrain the utilization of shared resources such as morphological awareness.

Summary conclusions

In this chapter, we have discussed the importance of metalinguistic awareness, particularly morphological awareness, as a shareable resource for second language reading. Through cumulative experience and exposure to text in their L1, readers develop an awareness of linguistic structure that is abstract in nature and which can be utilized when reading in later-acquired languages. Thus, a reader's morphological awareness that is developed through input in their L1 may be a shareable resource for L2 reading and learning as well. As shown in the study reported here, this may also occur across languages with disparate writing systems and morphological structures, though with the requirement that the L2 reader have a certain amount of linguistic knowledge in the L2 in order to utilize the shared resources.

The findings reported here underscore the importance of conceptualizing reading as a multi-componential system when exploring cross-linguistic interactions in L2 reading development. As a complex information processing system, reading involves a number of distinct mechanisms working in unison to construct meaning from text. Reading in an L2 additionally implies the involvement of two or more languages working together in this multi-componential system. Research such as the study reported here illustrates the complex cross-linguistic interactions that occur between L1 competencies and L2 linguistic knowledge as L2 learners' reading skills develop.

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