

Second language phonology at the interface between acoustic and orthographic input

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Recently researchers have become increasingly interested in the influence of orthographic forms on second language (L2) phonology. Orthographic forms (or ‘spellings’) represent the sounds and words of a language in writing. L2 learners, in particular those in instructed settings, are simultaneously exposed to the orthographic forms and the phonological forms of the target language. Recent investigations have indicated that orthographic input can affect learners’ phonological development and word learning in their second language in various ways. The availability of L2 orthographic forms in the input to L2 learners can facilitate speech production, perception and/or word form learning (Escudero, Hayes-Harb, & Mitterer, 2008; Showalter & Hayes-Harb, 2013), it can hinder target-like acquisition (Bassetti, 2007; Hayes-Harb, Nicol, & Barker, 2010), or indeed it can have mixed effects or no effect at all (Escudero & Wanrooij, 2010; Simon, Chamblessb, & Alvesc, 2010).

Rather surprisingly, systematic empirical research on orthographic effects on L2 phonology is a relatively recent enterprise, despite the fact that L2 teachers have long known that orthographic forms can affect pronunciation (e.g., Kenworthy, 1987). A few pioneering studies appeared in the late Nineties, most notably by Young-Scholten (Young-Scholten, 1998, 2002; Young-Scholten, Akita, & Cross, 1999). However, widespread interest in orthographic effects on L2 phonology only emerged in the late 2000s. That is when sizeable numbers of papers started to appear in various journals (e.g., Bassetti, 2007; Detey & Nespoulous, 2008; Silveira, 2009; Simon, Chamblessb, & Alvesc, 2010; Steele, 2005), two articles on L2 phonology appeared in a journal special issue devoted to effects of orthography on phonology (Escudero & Wanrooij, 2010; Hayes-Harb, Nicol, & Barker, 2010), and the first overview was published (Bassetti, 2008). The first scientific meeting on the topic of orthographic effects on L2 phonology was only held in 2013 (Bassetti, Hayes-Harb, & Escudero, 2013, EuroSLA, August), and at the time of writing (early 2014), no edited collection of papers or monograph has yet appeared. There are probably various reasons for this disregard, most notably a lack of theoretical justification as well as the zeitgeist, as L2 phonological research has been dominated by linguistics’ search for the universals of language and the primacy of spoken language, and language teaching has been dominated by the communicative approach. Within this context, when researchers came across possible orthographic effects it was typical to ignore them as irrelevant, inconsequential, or as ‘noise in the data’.

Orthographic effects on L2 phonology cannot be ignored any more, for many reasons. An obvious reason is the huge and rapidly increasing amount of empirical evidence that has recently accumulated. This could be due to the stubborn dedication of a small group of researchers, including the contributors to this special issue, as well as the growing interest among psychologists in the effects of orthography on phonology in native speakers. However, there are other reasons. Firstly, orthographic effects on L2 phonology are a widespread and pervasive phenomenon. Not only do they affect vast numbers of learners, they also affect all aspects of L2 phonology, including perception, production and acquisition of L2 sounds and words. Secondly, this research has important implications for theory, most notably models of L2

phonological development, but also the growing research on orthographic effects on native phonologies. Thirdly, there are obvious implications for language learning and teaching. It is thus time to start treating orthographic input as an empirical variable in the study of second language acquisition. The effects of orthographic forms should be tested in their own right, instead of being an after-thought used to explain unexpected findings, or ignored altogether. Evidence of orthographic effects on L2 phonology should start informing models of L2 phonological development, adding orthographic input as a factor, and in turn providing a theoretical justification for this line of research. Psychologists working on native phonologies should start taking into account the findings of research on L2 phonologies.

So, what next? The most urgent need for this emerging research area is to collect systematic data. We need to document the extent of orthographic effects across a variety of language and writing systems combinations. As the field matures, we need to gather data that answer increasingly specific questions. At present, questions may include: Why does orthography affect L2 phonology? To what extent? Under what circumstances? As we learn more, we will be able to tackle more precise questions and to produce a more thorough picture of orthographic effects.

The present special issue aims at providing a first overview of this line of research, addressing a number of timely issues in the study of the acoustic-orthographic interface in L2 phonology. Papers investigate both speech perception (Escudero; Showalter & Hayes-Harb) and speech production (Bassetti & Atkinson; Rafat; Young-Scholten & Langer), as well as word learning and recognition (Escudero; Rafat; Showalter & Hayes-Harb). Participants have a variety of native language (English, Italian, Spanish) and target language (Arabic, Dutch, English, German, Spanish) pairings. One study investigates a script other than the Roman alphabet (Arabic; Showalter & Hayes-Harb), the others look at phonologically transparent and opaque alphabetic systems, with one (Escudero) specifically comparing native users of a transparent and an opaque orthography. There are also different degrees of familiarity with the target language and writing system, as participants range from naïve listeners or readers facing a novel language (Rafat) and script (Showalter & Hayes-Harb) for the first time, to developing (Young-Scholten & Langer) and experienced L2 speakers (Bassetti & Atkinson) who are naturalistic (Young-Scholten & Langer) or instructed (Bassetti & Atkinson) learners, with one study directly comparing naïve and developing learners (Escudero).

Most of the studies reported in this issue use a one-off experimental approach, while Young-Scholten and Langer present a longitudinal study.. Tasks cover the whole continuum from spontaneous to controlled, ranging from spontaneous production in interviews (Young-Scholten) to picture naming (Rafat), word repetition (Bassetti & Atkinson), reading aloud (Bassetti & Atkinson) and auditory word-picture matching (Escudero; Showalter & Hayes-Harb). The issue also includes a review paper which raises issues about the interpretation of psycholinguistics findings and future directions for research (Cutler). Placed at the end of the issue, this paper raises theoretical and methodological issues of importance for researchers working in the field. The papers in this special issue then provide a nice snapshot of the varied research being currently done in the field, and provide future directions for the field's research agenda.

In the next article, entitled '*Effects of orthographic forms on pronunciation in experienced instructed second language learners*', Bassetti and Atkinson investigate orthographic effects on the pronunciation of familiar words in experienced L2

learners of English who were native users of a phonologically transparent writing system. Using tasks with different types of input (no input, acoustic input, orthographic input) and auditory and acoustic analyses, the authors found that silent letters result in consonant additions, vowels spelled with a vowel digraph are produced as longer than the same vowels spelled with a singleton letter, the spelling <ed> results in voicing and vowel addition in the production of the past tense marker, and different spellings result in homophonic words being pronounced differently. Orthographic effects were found with all tasks, albeit stronger in reading than repetition tasks. The article is interesting in that it provides data on a variety of orthographic effects on L2 speech production. While much previous research focussed on novel languages or pseudowords, this study shows that orthographic effects can be found in experienced learners' production of familiar words. Bassetti and Atkinson thus indicate that future researchers could profitably look at orthographic effects in experienced learners and second language speakers, and also investigate words

'The role of orthographic input in L2 German: Evidence from naturalistic adult learners' production', by Young-Scholten and Langer describes orthographic effects on the production of L2 German phonemes in naturalistic learners over a period of one year. The three young adult learners, who had not studied German before, were spending a year abroad in Germany, where they were exposed to much aural input, as well as written input. Following interviews at four points during the year, occurrences of two target German phonemes were analysed using auditory and acoustic analyses. Orthographic effects were found, as learners produced allophones of L2 phonemes that were consistent with the grapheme-phoneme correspondences of their L1 orthography. The study is original in its longitudinal approach and its focus on uninstructed learners. While most previous research has investigated (and demonstrated) effects in instructed learners, this study reveals orthographic effects in a naturalistic context, and specifically interference from L1 grapheme-phoneme correspondences. It appears that being exposed to environmental written input affects L2 phonology, in spite of the large amount of exposure to aural input. The paper is evidence that more research is needed on naturalistic learners. Furthermore, future researchers could compare orthographic effects in instructed and naturalistic learners, which has never been done so far.

Escudero's article, *'Orthography plays a limited role when learning the phonological forms of new words: The case of Spanish and English learners of novel Dutch words'*, demonstrated that regardless of linguistic background and type of native orthographic system (opaque versus transparent), orthographic information did not help naïve listeners to learn words that differed in almost all their phonemes (non-minimal pairs) or words that differed in a single phoneme (minimal pairs) that listeners are able to distinguish in their native languages (e.g. /i/-/a/). Out of all the word pairs presented to the learners (51 non-minimal and 15 minimal pairs), orthography only helped two non-native contrasts that were relatively easy to discriminate. Escudero suggests that avoiding orthographic input may well be a good strategy for L2 learners and teachers as its negative effects may outweigh positive effects, which in her study were only redundant, as listeners could already auditorily discriminate the contrasts for which a positive effect of orthography was demonstrated. The author suggests that the field should move toward examining the

effect of auditory training in improving the perception of difficult L2 contrasts as well as L2 word learning and recognition.

Showalter & Hayes-Harb, in their paper entitled '*Native English speakers learning Arabic: The influence of novel orthographic information on second language phonological acquisition*', examined the impact of orthographic input when the writing system is entirely novel to learners. They taught naïve native English speakers a set of Arabic word pairs differentiated by the voiceless velar /k/ versus uvular /q/ stop contrast (e.g., /kubu/ versus /qubu/). In some word learning conditions, participants were exposed to the Arabic written forms of the words, which systematically encodes the velar-uvular contrast via distinct graphemes, while in other word learning conditions, participants saw Roman written forms (e.g., <kubu> versus <qubu>). The authors further manipulated the availability of explicit instruction about the Arabic writing system, in addition to attempting to reduce task difficulty by reducing the number of talkers producing the stimuli. Despite the various orthographic input manipulations, Showalter and Hayes-Harb found no beneficial effect of the availability of written forms during word learning. They conclude that while orthographic input has been found to benefit learners under some circumstances, this benefit may be limited in the case of particularly difficult novel auditory contrasts.

Rafat presents an investigation of the interaction of orthographic and auditory input, looking specifically at the acoustic properties of the auditory input, in her paper entitled '*The interaction of acoustic and orthographic input in the L2 production of Spanish assibilated/fricative rhotics*'. Naïve native English speakers were taught Spanish words containing the word-final assibilated/fricative rhotic [r□] and were later asked to produce the words. In one word learning condition, participants saw written forms (with <r> for the rhotic); participants in the other word learning condition did not see written forms. Rafat found that participants who did not see written forms were more likely to produce the word-final rhotic as fricatives (e.g., [□, s, h]); while participants who had access to written forms were more likely to produce rhotics (e.g., [r□, □], indicating that the written input aided participants in noticing the rhoticity of the word-final segments. Rafat also found that the acoustics of the tokens presented during word learning also impacted participants' productions: participants who were exposed to orthographic input were also influenced by the strength of acoustic cues to assibilation/frication/rhoticity when producing the word-final rhotics. Rafat concludes that orthographic input can override auditory input under some circumstances, and that the acoustic properties of the auditory input can exert additional influence over learners' word productions.

In her discussion paper for the special issue, '*Orthographic effects in second language phonology*' Cutler reminds us that the primary interest to L2 learners and teachers is whether orthography can help with L2 phonological distinctions that are particularly difficult to perceive (e.g., where one native-language phonemic category captures two L2 categories). After presenting a thorough review of the relevant spoken-word recognition literature, she argues that although orthographic information can lead to the formation of distinct lexical representations, it cannot help learners' ability to auditorily perceive a non-native phonemic distinction. The author then demonstrates that this situation, having an L2 lexical contrast that the learner cannot discriminate in perception, can create an even larger problem as words containing the difficult phonemes become even harder to recognize, because perception maps less accurately to lexical content. This means that the apparent facilitating role of orthography in fact leads to more negative effects in L2 phonology. In conjunction with the findings of at least two other articles in the special issue (Showalter &

Hayes-Harb and Escudero), Cutler's discussion article seems to suggest that L2 learners and teachers should try to avoid orthographic information when the task is to learn new phonemic distinctions.

In conclusion, it appears that research on orthographic effects on second language phonology is moving forward quickly. Findings will be relevant to theorists, not only those working specifically on phonological development (whether in a native or second language), but also those working on second language acquisition or indeed language acquisition in general. Furthermore, findings have practical implications, as they have the potential to inform language teaching practices. It is to be hoped that research will flourish and more and more researchers will join this enterprise.

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