The Role of Native-Language Phonology in the Auditory Word Identification and Visual Word Recognition of Russian–English Bilinguals

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Abstract Does native language phonology influence visual word processing in a second language? This question was investigated in two experiments with two groups of Russian-English bilinguals, differing in their English experience, and a monolingual English control group. Experiment 1 tested visual word recognition following semantic categorization of words containing four phonological vowel contrasts (/i/-/u/, /I/-/ʌ/, /i/-/I/, /ε/-/æ/). Experiment 2 assessed auditory identification accuracy of words containing these four contrasts. Both bilingual groups demonstrated reduced accuracy in auditory identification of two English vowel contrasts absent in their native phonology (/i/-/I/, /ε/-/æ/). For late-bilinguals, auditory identification difficulty was accompanied by poor visual word recognition for one difficult contrast (/i/-/I/). Bilinguals’ visual word recognition moderately correlated with their auditory identification of difficult contrasts. These results indicate that native language phonology can play a role in visual processing of second language words. However, this effect may be considerably constrained by orthographic systems of specific languages.

Keywords Auditory identification · Visual recognition · Bilingual · Phonology · Vowels · Russian · English · Reading

Introduction

Perception of spoken and written words in a second language (L2) may be a difficult task, especially for late-learners. Even after many years of practice, some areas of L2 processing remain problematic and are not easily ameliorated by training (Strange 1995). One of such difficulties is in the fundamental ability to accurately perceive individual phonemes of a
nonnative language. For example, otherwise highly proficient bilinguals commonly experience difficulty in auditory identification and discrimination of certain nonnative phonemes, while they perform similarly to native speakers in the perception of other nonnative phonemes (Flege et al. 1994; Jia et al. 2006; Tsukada et al. 2005). Perhaps, one of the most extensively researched cases of this perceptual deficit is the perception of the /r/-/l/ contrast by Japanese learners of English (Aoyama et al. 2004; Polka and Strange 1985). Native Japanese speakers experience difficulty in auditory discrimination of words such as ‘rock’ and ‘lock’ despite high performance accuracy with other English consonants. Similarly, native speakers of German, Spanish, Korean and Mandarin Chinese may experience difficulty in perceiving the distinction between English /i/-/I/ and /E/-/æ/ (Bohn 1995; Jia et al. 2006; Tsukada et al. 2005). These phoneme-specific perceptual deficits have been observed in the perception of many consonant and vowel sounds in a variety of native-nonnative language combinations.

Generally, these difficulties have been attributed to the relative correspondence in the composition of native (L1) and nonnative phonological categories of particular L1–L2 language pairs, as originally suggested by Trubetzkoy 1939/1969) and further elaborated by others (Best 1995; Flege 1995; Strange et al. 2007). In this view, the phonemes of L2 are perceived through a “sieve” of the L1 phonology. Nonnative phonemes that do not have unique phonemic counterparts in L1 may become ambiguous across one or more native phonological categories (where each phonological category is presumed to include one phoneme). Such nonnative phonemes pose greater perceptual difficulty for nonnative speakers (Best 1995; Flege 1995). In extreme cases, words containing such difficult to perceive nonnative phonemic contrasts may be considered homophones for nonnative speakers (e.g., ‘bad’ vs. ‘bed’ may be heard as the same word by native speakers of Russian because Russian does not have separate phonological categories for /æ/ in ‘bed’ and /æ/ in ‘bad’, but rather one /æ/ category in that region of vowels space). However, bilinguals’ auditory perceptual abilities with such difficult nonnative phonological contrasts are also strongly affected by such factors as the age of acquisition and the amount of L2 experience (Flege 1995; Jia et al. 2006; Levy and Strange 2008).

To date, most research examining the role of native-language phonology in L2 processing has concentrated primarily in the auditory modality. Indeed, because phonology deals explicitly with the sound patterns of a language, this research focus is well-justified. On the other hand, a separate extensive body of research, conducted primarily with monolinguals, has demonstrated that phonology can also affect visual word processing and lexical access in a variety of ways (Goldinger et al. 1992; see also Perfetti 1999, for a review). For instance, the speed and accuracy of naming and lexical decision responses to specific target words can be influenced by priming them with homophones of semantically related words (e.g. the prime ‘beech’, which is a homophone of ‘beach’, can affect responses to the target word ‘sand’; Lesch and Pollatsek 1993; Lukatela and Turvey 1991). Although there is general agreement that lexical access during semantic processing involves activation of phonological codes, even during silent reading (Goldinger et al. 1992; Lukatela et al. 2004; Lukatela and Turvey 1991), many questions remain regarding specific processes and mechanisms underlying these effects. For example, it has not yet been fully understood whether phonological activation is always obligatory during semantic processing of words, or under what circumstances phonological processing may be instrumental for acquiring a word’s meaning (Perfetti 1999).

Despite the abundance of evidence indicating a variety of effects of phonology on visual word processing, few studies have investigated the role of phonology in visual word processing of bilinguals. Available findings indicate that phonological activation during reading may not be language specific (Haigh and Jared 2007; Studnitz and Green 2002). That is,