Phonotactic cues in L2 speech segmentation

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Phonotactic cues describe the permitted combination of sound sequences within a language. Although languages can share similarity in their phonotactic constraints, this is not always the case. For example, both English and German words may begin with /l/ (e.g. English *laundry*; German *Leder*), but the /sl/-onset common in English words (e.g. *sleep*, *slack*, *slip*) is phonotactically illegal in German, except for loanwords from English (Giegerich, 1992; Wiese, 2000). Although L2 learners can use L2 phonotactic constraints during word segmentation, conflicting cues from their L1 may be particularly difficult to overcome (Weber & Cutler, 2006). Weber and Cutler (2006) examined proficient L2 English speakers, however, raising the question of at what acquisition level L2 learners begin to use phonotactic cues to segment L2 speech. Using a paradigm similar to Weber and Culter (2006), we examine how L2 proficiency modulates learner's ability to use L2 English phonotactic constraints when segmenting words from L2 English as well as prevent interference from L1 German.

So far, 17 adult German speakers have been tested, with the goal of testing 80 participants total. Unlike Weber and Cutler (2006), these participants were not highly proficient in English (LexTALE score *M* = 70.8; *SD* = 10.2; Lemhöfer & Broersma, 2012). Nonsense words were constructed (*n* = 247), 46 of which were critical target words with an embedded English word. Critical target words beginning with w (*n* = 26) or l (*n* = 20) were chosen to compared the influence of word-onsets that are pronounced similarly in both languages (e.g. /l/) or possibly assimilated to an existing L1 category (e.g. /w/ to /v/). The boundary between the nonsense segment and the English word was varied to produce four different boundary conditions to test participants' use of phonotactic constraints that are valid in both English and German, just English, just German, or neither language (see Table 1 for an overview). An L1 American English speaker recorded the stimuli, taking care to avoid producing clear syllable boundaries. Participants were instructed to listen to the nonsense words and indicate by button press as quickly as possible whether they recognized an embedded English word. Reaction time (RT) and accuracy were compared between the *No Boundary* condition and the other three conditions to examine the types of phonotactic constraints L2 learners use during L2 speech segmentation. For example, if participants have higher accuracy and faster RTs for words in the *English* compared to *No Boundary* condition, this would indicate that these participants may use L2 English phonotactics to constrain their word recognition during L2 speech segmentation.

The preliminary data from participants' RTs for correct responses to critical target words were evaluated using mixed-effects linear models (see Figure 1). The maximal model included a fixed effects of boundary condition (*Common, English, German, No*), word-initial phoneme (*l*, *w*) and LexTALE score in a full interaction and a random intercept for subject (an analysis of accuracy will also be conducted on the full dataset). Estimated marginal means (EMM) were calculated using the R package *emmeans* (Lenth, 2019). RTs were significantly faster for words beginning with /l/ (EMM = 669, SE = 45.9) compared to /w/ (EMM = 755, SE = 44.8; β = 43.34, t value = 2.27, *p* = .007). The interaction between the factor word-initial phoneme and the boundary condition contrast between the *English* and *No Boundary* was also significant (β = -65.36, t value = -2.35, *p* = .02). RTs were faster for w-initial words in the *English* (EMM = 703, SE = 59.5) compared to *No Boundary* conditions (EMM = 744, SE = 57.4), but this pattern was reversed for l-initial words (*English*: EMM = 747, SE = 62.0; *No*: EMM = 659, SE = 63.0). No other effects or interactions were significant. The preliminary analysis indicates that lower-proficiency L2 English learners may use English phonotactic constraints to segment and recognize words in their L2, but only for words that begin with /w/*,* perhaps because this sound is clearly an L2 English sound, unlike /l/. More data is needed to draw strong conclusions, especially regarding the role of L2 proficiency.

Table 1. Overview of the different boundary conditions. Constraint refers to whether a word boundary is forced between the nonsense segment and the English word and if so, in which language(s). Example w- and l-initial items are also given.

Condition	Constraint	Example items	
		w-initial	l-initial
No Boundary	Neither language	theekwant; /ðikwɒnt/	jefletter, /jiflɛtər/
English Boundary	English	grooshwant, /gruʃwɒnt/	rooshletter, /ruʃlɛtər/
German Boundary	German	nootwant, /nutwɒnt/	poosletter, /puslɛtər/
Common Boundary	Both languages	jarlwant, /jarlwɒnt/	pownletter, /paʊnlɛtər/

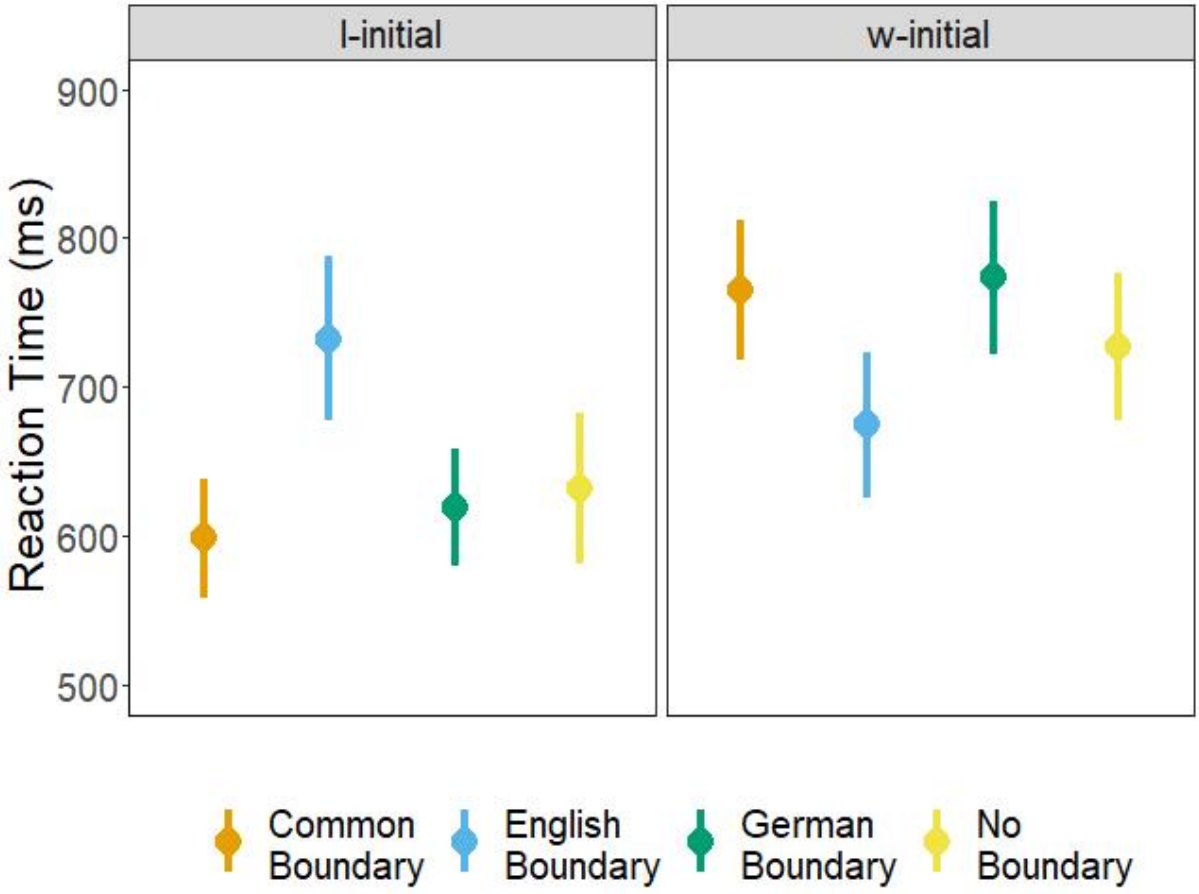

Figure 1. Average reaction time (with SE whiskers) for the Common, English, German, and No Boundary conditions for both w- and l-initial words.

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