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Phonological Challenges at the Right Edge of Words: Second Language Learners are Strategic

単語の右端における音韻上の課題:
第二言語学習者は方略的である

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Abstract

This paper argues that L2 learners are strategic: they use their L1 grammar to optimize target-like production of codas and consonant-shaped inflectional morphology, when errors would not be detected by native speaker interlocutors. Study I examines production of inflectional *s* versus coda *s* in two groups of Mandarin-speaking learners of English. The 'variable deletion' group is strategic: they use their L1 representation for inflection when possible, enabling them to produce inflectional *s* half of the time. Both groups of learners consistently produce coda *s* in monomorphemic words. However, this does not help with the production of inflection for the less strategic 'across-the-board deletion' group, as this group has no means to represent and thus produce inflection with the grammar they have built for English. Studies II and III compare production of coda *s* and coda *l* in a Mandarin speaker with near-native proficiency in English and in a Burmese speaker with high-intermediate proficiency in English. Both studies show that L2 learners can be strategic, independent of proficiency level: they adapt the L1 grammar for coda *s* when repairs involving substitution or deletion would be detected by English-speaking interlocutors; they attend less to optimizing production when errors would be less costly, leading to substitution and deletion in the case of coda *l*. Study IV examines the production of word-final codas in a Japanese speaker with near-native proficiency in English. Japanese only permits placeless nasals in final position, whereas English permits a wide range of consonants. It is shown that learners can repurpose their L1 representation of word-medial geminates for final codas, leading to productions that appear to be on target for English, but instead employ strategies drawn from the L1 grammar.

要旨

本稿では、第二言語学習者が方略的であることを示す。第二言語学習者はネイティブスピーカーに気づかれない場合、音節末子音や子音からなる屈折形態素の産出を、母語文法を利用して最適化していると指摘する。まず研究 1 では、中国語を母語とする英語学習者の 2 グループによる、屈折形態素の「s」と音節末の「s」の産出を調査した。「可変的削除」グループは方略的であり、可能な限り母語の表象を用いて、屈折形態素の*-s* を約半数のケースで発音する。どちらのグループも単一形態素からなる語の末尾の「s」は一貫して発音するが、方略性の低い「全削除」グループでは、彼らの構築した英語文法に屈折形態素を表象し、産出する手段を持たないため、屈折形態素の s が産出されない。研究 2 および 3 では、英語母語話者に近い能力を持つ中国語話者と中上級の英語能力を持つビルマ語話者を対象に、音節末の「s」と「l」の産出を比較した。どちらの研究においても、第二言語学習者は習熟度に関係なく方略的であることが示された。置換や削除による修正が英語話者に気づかれやすい音節末の「s」の場合には、彼らは母語の文法を活用するが、誤りがそれほど問題とならない音節末の「l」の場合は、最適化にあまり注意を向けずに置換や削除を行う。研究 4 では、英語母語話者に近い能力を持つ日本語話者を対象に、語末の子音の産出を調査した。日本語では語末に調音点素性のない鼻音しか許されないが、英語ではさまざまな子音が許される。その結果、学習者は彼らの母語にある語中の長子音の表象を語末の子音に転用することで、英語に適した形に見えるが、実際には母語の文法に基づいた方略を用いていることが示された。

1 Introduction

Second language (L2) learners face challenges with prosodic complexity not permitted in their L1 grammar. At the right edge of words, learners of English may be tasked with: expanding the range of consonants permitted in existing syllable positions (i.e., codas); acquiring new structures (complex codas); and/or determining the appropriate representation for strings that arise through the addition of consonant-shaped inflectional morphology: is inflection organized as a regular coda or as some type of phonological clitic?

This paper has two objectives. The first is to show that L2 learners are *strategic*: learners use their L1 grammar to optimize target-*like* production of codas and consonant-shaped inflectional morphology in the L2, particularly when errors would fail to be detected by native speakers. However, learners adapt their L1 grammar when errors are too costly, that is, when they would be easily identified. The second objective is to show that probing into prosodic representation (of inflection, at the level of the syllable) is critical to understanding the patterns that L2ers' display at the right edge of words.

Production data will be drawn from Mandarin-, Burmese- and Japanese-speaking learners/users of English (henceforth learners or L2ers) from four studies. Study I examines elicited production of inflectional *s* versus coda *s* in Mandarin-speaking L2ers of English; we will

observe that *s* in these two types of constructions does not show the same developmental profile, in spite of surface similarities between the strings that host these different types of *s*. The performance on coda *s* from this study will lead us, in Studies II and III, to compare spontaneous production of coda *s* and coda *l* in a Mandarin-speaking L2er with near-native proficiency in English and in a Burmese-speaking L2er with high-intermediate proficiency in English, respectively. The stark contrast that learners display on these two segments, regardless of proficiency, will lead us finally to Study IV, which probes patterns in the production of a wide range of codas in a Japanese-speaking L2er with near-native proficiency in English.

2 Study I

2.1 Context

In Study I, we compare the production of inflectional *s* versus coda *s* in Mandarin-speaking L2ers of English, where *s* is phonetically realized as [s] or [z]. As we will see, inflection is prosodically represented in different ways across languages and, thus, we cannot conclude, without probing further, that *s* in the data in (1a) has a coda representation in English, as it does in the monomorphemic words in (1b).

(1) a. Inflectional *s*:

[tæks]	'tacks'
[siːz]	'seas'
[fɑlz]	'falls'

b. Coda *s* (monomorphemic words):

[tæks]	'tax'
[siːz]	'seize'
[fɑls]	'false'

Given that similar strings of segments are involved in (1a) and (1b), and that the context, the right edge of words, is identical, we might conjecture that inflectional *s* and coda *s* should present the same challenges for learners. This, though, is not supported. Instead, production of codas in monomorphemic words typically precedes production of inflectional morphology (Bayley, 1996; Wolfram & Hatfield, 1984; cf. Lardiere, 2003). Clearly, the grammar of inflectional *s* is more complex than that of coda *s* but we must examine production patterns further to understand where the difficulties lie for learners and whether there might be contexts where learners can be strategic, as defined in (2), and produce forms that sound target-like but do not actually employ the target representation.

(2) Strategic learners:
Second language learners use their L1 grammar to optimize target-*like* production of L2 constructions that are absent from the L1 when errors would fail to be detected by native speakers.

To probe this possibility, we begin with the observation that inflectional morphology is produced *variably* by L2ers when the L1 grammar does not overtly mark the morpheme in

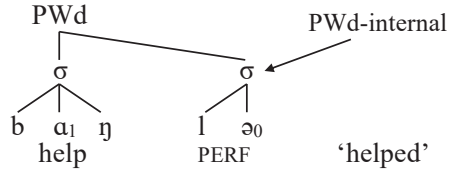
question (e.g., Lardiere, 1998, 2003). We compare two phonological approaches, which attribute variation either (i) to difficulties organizing inflection into higher prosodic structure (see Goad & White, 2019, for an overview); or (ii) to mismatches in syllable structure between the L1 and target L2 grammars (e.g., Bruhn de Garavito, 2008; Lardiere, 2003). We show that patterns in the variable data support (i), in line with the Prosodic Transfer Hypothesis (PTH) in (3) (adapted from Goad & White, 2004; Goad, White, & Steele, 2003). Nevertheless, mismatches between L1 and target L2 syllable structure can help inform the role that prosodic transfer may play.

(3) Prosodic Transfer Hypothesis (PTH):
Difficulties that learners have with the production of inflectional morphology stem from constraints on prosodic structure that are transferred from the native language grammar; inflection may be variably produced or produced in non-target fashion if the necessary prosodic representations are not available in the L1 grammar.

As mentioned, inflectional morphology is prosodified in different ways *across* languages, reflecting syntactic and phonological constraints on how closely bound it is to an adjacent lexical host (cf. Nespor & Vogel, 1996; Selkirk, 1996). In the usual case, however, inflectional morphemes are uniformly represented *within* a given language, determined by the syntax–phonology mapping that holds in that language.

Mandarin and English differ in the way that they represent inflection. In Mandarin, inflection (aspect only) is organized internally to the prosodic word (PWd) of the host to which it attaches, as shown in (4) (Goad & White, 2006; Goad et al., 2003).

(4) Prosodic representation of inflection in Mandarin:

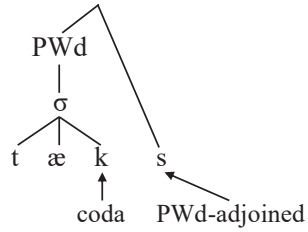


In English, in contrast, inflection is adjoined to the PWd of the host to which it attaches, as shown in (5a). Inflectional consonants are not organized PWd-internally, akin to ordinary codas, as can be seen in the illicit representation for English in (5b); compare final consonants in monomorphemic words in (5c).

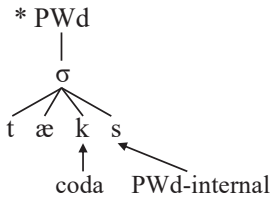
Setting aside segmental and syllabification differences between English and Mandarin, the illicit representation for inflectional *s* in English in (5b) is parallel to the representation for inflectional *le0* in Mandarin in (4). Is it thus the representation that will likely be transferred into English from the L1 Mandarin grammar. Part of the acquisition challenge for Mandarin-speaking learners is to determine whether the transferred representation is suitable for English inflection, or whether an alternative, namely the representation in (5a), is required.

(5) Prosodic representation of inflection versus true codas in English:

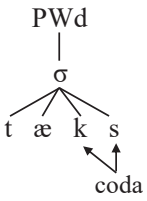
a. Inflected ‘tacks’:



b. Mandarin-like representation for ‘tacks’:



c. Monomorphemic ‘tax’:



One source of evidence that learners can use for determining the representation of right-aligned inflection is length constraints on rhymes.[1] The examples in (6a) show that word-final rhymes in monomorphemic words are maximally three positions long in English (VVC or VCC).[2] Indeed, a maximum of three largely reflects the upper bound observed across languages (cf. Harris, 1994; Kaye, 1990). Inflection appends another consonant to the rhyme, but the forms in (6b) show that length constraints are not respected in such words; there is, for example, no consonant deletion to accommodate inflection (e.g., *[teiz] ‘tails’, *[hɛps] ‘helps’).

(6) English syllable structure constraints:

a. Maximal rhyme length in monomorphemic words:

VVC		VCC		*VVCC, *VCCC
[teil]	‘tail’	[hɛlp]	‘help’	*[heilp]
[teip]	‘tape’	[hɛlm]	‘helm’	*[hɛlmp]

b. Inflected forms in English:

VVC-C		VCC-C	
[teilz]	‘tails’	[hɛlps]	‘helps’
[teips]	‘tapes’	[hɛlmz]	‘helms’

Learners can conclude from this that inflectional suffixes in English are not represented akin to ordinary codas (5b); they must instead be loosely attached to their base, as in (5a), so as not to trigger deletion (rhyme shortening). And although no deletion would be expected with inflected shorter stems (e.g., VV-C [peiz] ‘pays’, VC-C [tæps] ‘taps’), recall that inflectional morphemes are, in the usual case, uniformly represented in a given language. Thus, learners should conclude from forms like those in (6) that inflectional *s* is always adjoined to the PWd of its host, independent of the length of the final rhyme in the base to which it attaches. We

[1] Other sources of evidence include phonotactics and stress; see Austin, Chang, Kim, and Daly (2022) and Goad, Bruhn de Garavito, and White (2011) for detailed examination of these in Korean-speaking learners of English and French-speaking learners of Spanish, respectively.

[2] With limited exceptions (see Goldsmith, 1990; Harris, 1994).

will return to the significance of this when we consider whether learners of English are strategic in the domain of inflection.

One challenge for Mandarin-speaking learners is that the adjunction structure required for English is seemingly not present in the Mandarin grammar. In view of this, we will observe that Mandarin speakers have difficulties appropriately organizing English inflectional morphemes into prosodic structure (as per the PTH in (3)). Further, these difficulties continue to occur after the stage when learners can produce clusters at the right edge of monomorphemic words ('tax' ✓[tæks], but 'tacks' [tæk-s] → [tæk]) and when the segments involved in inflection have been acquired in coda. We demonstrate each of these in the following sections.

2.2 Experiment

We explore the acquisition of agreement morphology in L2 Mandarin-English, building on Goad et al. (2003). We begin with Mandarin-speaking learners' production of agreement, then turn to production of final clusters and coda *s*, from the perspective of English syllable structure constraints.

2.2.1 Method

Participants were twelve learners at high intermediate/low advanced levels of proficiency. Proficiency was assessed using the grammar and vocabulary sections of the English Language Institute placement test. Production data were collected by means of a story-telling picture description task recounting a typical day in a woman's life. Data were narrowly transcribed with the assistance of Praat (Boersma & Weenink, 2024) and coded by native speakers of English.

2.2.2 Results and discussion

Participants followed two distinct patterns of behavior: deletion was observed in all contexts for six participants (henceforth, ATB (across-the-board) deletion group), as shown in the second column of Table 1. The six remaining participants produced agreement variably (henceforth, variable deletion group). Suppliance for this group depended on the length of the rhyme to which inflection attaches, 'short': two positions (VV or VC) (e.g., [gou] 'go', [kʌm] 'come', [tɑk] 'talk') or 'long': three positions (VVC or VCC) (e.g., [kliːn] 'clean', [θɪŋk] 'think', [kəlɛkt] 'collect'), as shown in the third column of Table 1.

Table 1. Suppliance rates for agreement (before C-initial word or pause; voicing errors ignored)

Stem-final rhyme	ATB deletion group	Variable deletion group
Short	7%	68%
Long	0%	9%

If the source of explanation for the behavior of these two groups of participants is phonology, we must consider whether the challenge lies with: (i) the prosodic representation

of inflection (the absence of (5a) from the Mandarin grammar) or (ii) syllable structure constraints (the lack of complex codas and/or coda *s* from Mandarin).

To arbitrate between these options, we examine the productions of each group of learners more carefully. Beginning with the ATB deletion group, deletion may indicate that these learners understand that English is not like Mandarin, that it does not permit an analysis of inflection inside the PWd of the base to which it attaches. If these learners are sensitive to the need for a single analysis of inflection, regardless of stem length, but their grammar does not permit the adjunction structure required for English, the result will be ATB deletion of inflection. Learners who follow this pattern are thus not being strategic as concerns production of inflectional *s*.

Turning to the variable deletion group, inflectional morphology surfaces for stimuli where it could be organized inside the PWd of the base to which it attaches (as in Mandarin (4)), coupled with knowledge of English syllable structure constraints. If this were the case, learners would only be able to employ the PWd-internal representation when it does not violate the upper bound on syllable structure constraints for English (a maximum of three positions in the rhyme, as shown in (6a)). The result of this analysis is variable production of inflection, but variability is predictable from stem length. Learners who follow this pattern are not using the target representation for inflection; indeed, they are not employing a single representation for agreement, one that is suitable for stems of all shapes. Nevertheless, they are being strategic, as agreement morphology can be produced about half of the time with this representation, namely after short stems.

Before we can accept the analysis that learners in the variable deletion group are more strategic than learners in the ATB deletion group as concerns their prosodic representation and production of inflectional *s* (as per option (i) above), we must consider the possibility that problems with syllable structure at the right edge of words underlie the patterns observed, that is, difficulties with coda clusters and/or with coda *s* (option (ii)). We consider each in turn.

One possibility is that the differences we have observed across groups with the production of inflection stem from the absence of coda clusters in Mandarin (as proposed by Lardiere, 2003, for Patty, a Mandarin- and Hokkien-speaking learner of English). A high proportion of words in English end in consonants and adding inflection creates clusters. Perhaps learners in the ATB deletion group are simply less advanced in the types of syllable complexity they permit in English; on this view, they would be expected to show more deletion for coda clusters (either C_1 or C_2) than the variable deletion group, parallel to their deletion of agreement morphology. At first glance, this explanation appears to find support, as Table 2 below will show that the ATB deletion group does indeed show more deletion of consonants from coda clusters (47% (i.e., 7% + 40%) compared with 22% (i.e., 13% + 9%) for the variable deletion group). When we probe further, though, we find that this explanation cannot hold.

To demonstrate this, we compare the two groups' production of word-final clusters in monomorphemic (CVCC) words (e.g., *thi<u>nk</u>*, *colle<u>ct</u>*) and short-stem inflected (CVC-C_{Agr}) words (e.g., *swi<u>ms</u>*, *tal<u>ks</u>*). Table 2 shows that, for the ATB deletion group, clusters in monomorphemic words are produced at a considerably higher rate (40% target-like) than is

observed for inflection (3% target-like). Clearly, difficulties with coda clusters cannot underlie the low rate of suppliance of agreement morphology for this group of learners. For the variable deletion group, a different pattern emerges: coda clusters in monomorphemic words and clusters containing agreement morphology are produced at very similar rates (64% and 63% target-like, respectively), suggesting that they have the same representation. Inflection is organized PWd-internally for this group, like in (4) for Mandarin, thereby resulting in parallel representations for inflection (5b) and monomorphemic words (5c) in English.

Table 2. Production of final clusters in monomorphemic (CVCC) and short-stem inflected words (CVC-C_{Agr}) (before C-initial word or pause; voicing errors ignored)

	ATB deletion group		**Variable deletion group**	
	Mono-morphemic	**Short-stem inflected**	**Mono-morphemic**	**Short-stem inflected**
Target-like	40%	3%	64%	63%
C_1 deletion	7%	0%	13%	0%
C_2/C_{Agr} deletion	40%	97%	9%	37%
Epenthesis	13%	0%	14%	0%

The final possible interpretation of the findings we must consider is that Mandarin-speaking learners have difficulties with coda *s*. Perhaps high deletion of agreement morphology for the ATB deletion group is not due to learners' prosodic representation for inflection and has nothing to do with whether or not learners are strategic; it could instead be due to the absence of coda *s* in the grammar of Mandarin. Mandarin codas are limited to nasals ([n] and [ŋ]) (Duanmu, 2007). Perhaps learners in the ATB deletion group are simply less advanced in the types of codas they permit in English.

Table 3 reveals that neither group of learners has difficulty with coda *s*: this segment is overwhelmingly produced as target-like, even by the ATB deletion group.

Table 3. Production of singleton *s* in word-final coda position in monomorphemic words (before C-initial word or pause; voicing errors ignored)

Pattern	**ATB deletion group**	**Variable deletion group**
Target-like	92%	93%
Substitution	0%	0%
Deletion	2%	0%
Epenthesis	6%	7%

We will explore why production of coda *s* is so successful in Studies II and III below. For now, we can hint that the explanation lies in both groups of learners being strategic as concerns syllable structure at the right edge of words. Success with coda *s*, however, does not guarantee success with inflectional *s*, even though both involve the same segment in final position. We see this for learners in the ATB deletion group. If these learners have determined that the Mandarin representation for inflection is not suitable for English, if they recognize the need for

a unified analysis of inflection, and if their production grammars do not permit the adjunction structure required for English, deletion is the only option for inflectional *s*. They cannot produce outputs involving inflection that are strategic (i.e., *s* after short stems only).

In sum, participants in the variable deletion group are strategic learners. They produce English inflection where they can, using their L1 (PWd-internal) representation when possible, leading to target-like production of inflectional *s* for short stems only.

Both groups of learners produce clusters in coda position in monomorphemic words about half of the time. Both groups produce final *s* in coda position in monomorphemic words over 90% of the time. Neither of these constructions helps with production of inflection for the ATB deletion group as this group has no means to represent and thus produce inflection with the grammar they have built for English.

Although we have seen that target-like production of coda *s* does not necessarily help with the production of inflectional *s*, one question is why, for both groups of learners, coda *s* is seemingly so easy to acquire. We explore this question in Studies II and III.

3 Study II

3.1 Context

Study II examines the production of coda *s* and coda *l* in a Mandarin-speaking L2er with near-native proficiency in English. Although *s* and *l* are both permissible onsets in Mandarin, neither forms a licit coda. In spite of this, previous research had observed that Mandarin-speaking L2ers produce coda *s* more faithfully than coda *l* (e.g., Hansen, 2001). This same finding holds in the current study, and our goal is to understand why. As we will propose that the difference in success with coda *s* versus coda *l* is strategic, the overarching question we ask is whether strategic learners can 'control' their learning (or usage) path in production. More specifically, can L2ers identify which errors will likely go undetected by English-speaking interlocutors and which ones will not? And if yes, does this lead them to attend less to optimizing production for segments where errors would be less costly (less easily noticed), in order to focus on production for segments where errors would be more costly?

3.2 Method

The data come from a case study of S11, a Mandarin-speaking professional, using audio recordings from two interviews (total time: 10 minutes) with a radio host (Zhang, 2021). Data were narrowly transcribed with the assistance of Praat. Zhang used a global accent task (Jesney, 2004) to assess proficiency in English. Fifteen native English speakers judged data from 16 participants (15 L2ers; 1 native speaker control) on a 9-point scale from least to most native-like. S11's average score was 8.00; three judges assessed him as being a native speaker of English (he scored 9/9) and two others assessed him as being equal in proficiency to the native speaker control (both participants scored 8/9).

Factors that likely contributed to the (near) native assessment of S11 were: his fast speech rate (which was faster than the native speaker control); his use of lenition and allophonic rules that characterize fast speech in native speaker productions; and possibly the ability to identify his speech as characteristic of a single dialect, namely Midwestern American English. Aspects of S11's vowel productions, in particular, identify him as a speaker of this dialect (as per Labov, Ash, & Boberg, 2008), which we return to below.

3.3 Results and discussion

Examination of the recordings revealed that S11's production of coda *s* is 100% accurate (uninflected contexts only, to ensure direct comparison with coda *l*). Given that Mandarin codas are constrained to [n] and [ŋ], as mentioned above, we might wonder why S11, at least on occasion, does not repair coda *s* in his English productions. Three plausible repairs are substitution, deletion, and epenthesis (see Table 3 in Study I as well).

From the perspective of phonological constraints alone, substitution of a native Mandarin coda for *s* would be optimal. There are, though, no suitable substitutes for *s* in the Mandarin coda inventory. Although [s] and [n] share place of articulation, nasals are perceptually too dissimilar from voiceless (strident) fricatives; substitution would undoubtedly be detected by interlocutors and thus too costly. Evidence for a lack of similarity between [s] and [n] comes from the observation that, in phonological grammars across languages, fricatives and nasals rarely, if ever, neutralize or alternate with each other.

Another possible repair for coda *s* involves deletion. However, in languages like English where *s* is strident, it is very salient (in contrast to languages like Andalusian Spanish; Romero, 1995). Strident *s* has strong internal cues for place and manner of articulation, enabling it to be well-perceived in all syllable and segmental contexts (Toda, Maeda, & Honda, 2010; Wright, 2004). Deletion involving *s* is thus also too costly.

The final repair to consider is epenthesis, which enables the unlicensed coda *s* to be resyllabified into onset position, where this segment is well-formed in Mandarin. This repair is not too costly (in the sense of the error being easily detected by English-speaking interlocutors); rather, it is less likely to occur for aerodynamic reasons. Earlier research on L2ers whose native languages do not license coda obstruents has shown that fricatives rarely trigger epenthesis, in contrast to stops (Ruffner, 2000; Tajima, Erickson, & Nagao, 2002). These authors explain this difference as follows: In the production of stops, air is trapped in the oral cavity. When the stop closure is released in coda position, this can result in epenthesis, as the epenthetic vowel appropriates the release portion of the stop. In the production of fricatives, in contrast, turbulent airflow is sustained and thus epenthesis is less common; in effect, a coda fricative inherently contains a vowel-like release.

Returning to S11, recall that his productions for coda *s* do not involve any repairs, neither substitution/deletion, which are costly (easily detected), nor epenthesis, which is dispreferred for aerodynamic reasons. We focus here on cost. To assess how cost may be factored in, we compare S11's productions of coda *s* with coda *l*. Zhang's (2021) study reveals that coda *l* was only 15% accurate in production. Substitution and deletion were both commonly observed, as

the examples in Table 4 show. We will return to the contextual factors that underlie the two different repairs shortly.

Table 4. S11's error patterns for coda *l* (adapted from Zhang, 2021)

Context	Error	Examples
[ɬ] after front vowel	substitution by [ʊ, o, ɔ]	[sɛɬ] → [sɛɔ] 'sell'
		[stɪɬ] → [stɪo] 'still'
[əɬ]	substitution by [o(ː)]	[pʰipəɬ] → [pʰipo] 'people'
		[ɪgzæmpəɬ] → [ɪgzæmpoː] 'example'
[ɬ] after back vowel	deletion + compensatory lengthening	[skuɬ] → [skuː] 'school'
		[oʊvəɹɔɬ] → [oʊvəɹɔː] 'overall'

In exploring why S11 has no difficulties with coda *s*, yet struggles with coda *l*, we must question whether the patterns observed for either of these segments reflect strategic learning. We begin with coda *s*, first examining the challenges it presents for production. *s* involves complex aerodynamic and physiological requirements (Shadle, 2012), including high articulatory force (Kent, 1992) that is difficult to maintain in coda position. Although this suggests that coda *s* should be late acquired, a different picture emerges from perception: as mentioned earlier, *s* is strongly cued, ensuring that it is easily identified in all contexts. The latter may compel strategic learners to acquire coda *s* early, even if it is difficult to faithfully realize *s* in this position; deleting or substituting another segment for *s* is too costly, as errors will easily be detected by English-speaking interlocutors.

Turning to coda *l*, why does S11 appear to struggle with this segment? In production, coda *l* is velarized ([ɬ]) in English, as shown in Table 4: the back of the tongue body is raised toward the soft palate, a secondary articulation to the primary gesture where the tongue tip makes contact with the alveolar ridge. Turning to perception, the tongue body gesture causes [ɬ] to be perceptually very close to back vowels. The strategic learner can thus use (or minimally adapt) the L1 vowel system to arrive at productions that very closely approximate [ɬ]. Errors involving substitution of back vowels for [ɬ] (after front vowels and for [əɬ]) will thus largely go undetected, as will errors involving deletion of [ɬ] (after back vowels). Both patterns are attested for S11, as seen in Table 4.

Before we can conclude that S11's error patterns for coda *l* involve strategic learning, we must question whether these patterns could instead be in the English input to which he was exposed. As Zhang (2021) points out, patterns for coda *l* similar to S11's productions occur in some dialects of English, for example, in Northeastern American English (e.g., New York, Philadelphia) as well as in Cockney and Estuary English. Importantly, though, these patterns do not occur in Midwestern American English (Labov, Ash, & Boberg, 2008), the dialect that S11 speaks, so this explanation is unlikely to hold.

In sum, there is motivation for learners to adapt L1 syllable structure constraints to accommodate coda *s*, less so for coda *l*. This is clearly reflected in the productions of S11. Errors for coda *l* go undetected, at least by some native speakers: recall that five judges assessed him with scores identical to those assigned to the native speaker control. As a strategic learner,

S11 can attend less to optimizing production of coda *l* where errors are less costly in order to focus his attention on production of coda *s* where errors would be more costly.

4 Study III

4.1 Context

In Study III, we probe whether less advanced learners show similar 'control' over their productions, that is, some awareness of the kinds of errors that can and cannot be detected by English-speaking interlocutors. We examine the production of coda *s* and coda *l* in a Burmese speaker with high-intermediate proficiency in English. We also examine production of coda stops (and nasals), to help interpret the findings for the two segments under focus.

4.2 Method

The data come from a case study of spontaneous production data from BF, a Burmese-speaking professional, using audio recordings from an 8 minute interview with a radio host. Production data were narrowly transcribed with the assistance of Praat (Boersma & Weenink, 2024). Native-speaker linguists judged BF's English proficiency as high-intermediate based on the recording.

Burmese coda constraints are as follows (Green, 2005; Watkins, 2011): word-final codas are restricted to [ʔ] and [ŋ], although [ŋ] is typically realized as nasalization of the preceding vowel. In this study, we use adaptation patterns for loanwords from English to inform us about the patterns that BF displays in her L2 productions of English coda consonants. Chang (2009: 7) observes that the phonological grammar of Burmese "heavily constrains the adaptation of English loanwords". This can be seen in (7) where obstruents are adapted as [ʔ], nasals are adapted as nasal vowels, and laterals undergo deletion.[3]

(7) Adaptation of singleton codas in Burmese loanwords (adapted from Chang, 2009):
   a. [s/z] → [ʔ]
   b. [p/b, t/d, k/g] → [ʔ]
   c. [m, n, ŋ] → [Ṽ]
   d. [ɬ] → Ø

Do the patterns that BF shows in her L2 English reflect transfer (i.e., patterns from the L1 grammar observed in loanword adaptation) or is BF a strategic learner, with productions for *s* and *l* that more closely reflect target English productions?

[3] [r] also deletes; it is excluded, as deletion of [r] in BF's productions could be due to the input she received (i.e., from Southern British English), independent of loanword adaptation. Fricatives other than [s/z] and affricates (all adapted as [ʔ] in loanwords) are also excluded, as they are underrepresented in the speech sample analyzed.

4.3 Results and discussion

BF's productions of singleton target codas from the interview are displayed in Table 5. Examples are limited to uninflected lexical and stressed function words. Target consonants are in the first column, organized by manner of articulation.

Table 5. Word-final singleton codas in SF's productions (before C-initial word or pause; voicing errors ignored)

	L2 production		
English target form	**Target-like**	**Errors**	**% target-like**
[s/z]	23	1	96%
[p/b, t/d, k/g]	25	30	45%
[m, n, ŋ]	26	48	35%
[ɬ]	6	45	12%

Table 5 shows that, similar to S11 in Study II, production of coda *s* ([s/z]) is near native-like. Since fricatives and stops are both adapted as [ʔ] in loanwords (shown in (7)), we might have expected both to be realized in this same manner in BF's productions. Productions for *s*, however, are much more target-like, which we attributed, in Study II, to the absence of suitable repairs for coda *s*. Stops can be deleted or substituted by [ʔ], both of which are very common in BF's productions, without serious risk of misidentification of the target words by interlocutors.[4] The greater number of target-like productions for *s* than for stops suggests that BF, like S11, is a strategic learner: coda *s* must be accurately produced; any type of repair will be detected by English-speaking interlocutors.

Turning to coda *l*, target-like production is remarkably low. If the L1 grammar is driving the repair, we would expect coda *l* to be deleted, regardless of the quality of the preceding vowel, reflecting the loanword adaptation patterns in (7). If instead BF is a strategic learner, like S11, we would expect deletion after back vowels and substitution of a back vowel for coda *l* after front vowels and for [əɬ], given that coda *l* is velarized in English.

We examine the error patterns for coda *l* in some detail in Table 6. *Tau* (τ) following the number of errors in a cell signals errors that reflect *transfer*: they are consistent with the L1 grammatical patterns observed in loanword adaptation in (7); deletion of [ɬ], at least after front vowels, falls into this category. *Stigma* (ς) reflects *strategic* learning: the errors yield outputs that likely go undetected by English-speaking interlocutors, namely substitution of back vowels ([ʊ], [ɔ], [ʌ]) for [ɬ] after a front vowel or for [əɬ] sequences.[5] (Errors marked with both tau and stigma, namely deletion after a back vowel, are consistent with both transfer and strategic

[4] For completeness, we point out that the most common error for nasals is substitution by a nasal vowel, which is what is expected from the L1 grammar as well as being strategic.

[5] The Burmese vowel inventory includes [ʊ] (allophonic), [ɔ] (phonemic), and [ə] (allophonic), but not [ʌ] (Chang, 2009). Substitution of [ʌ] for [əɬ] yields what is clearly a back vowel, close to [ɔ] but with no significant rounding. No productions of [ə] for [əɬ] were attested, suggesting that outputs for [əɬ] truly involve substitution, rather than deletion of [ɬ].

learning.) Most of BF's errors for coda [ɬ] are strategic: ranging from 69% (ς alone) to 89% (ς and τς), in contrast to 11% (τ alone) to 31% (τ and τς) that are due to transfer.

Table 6. Error patterns for word-final singleton codas in BF's productions

	Errors		
English target form	**Deletion**	**Substitution**	**Epenthesis**
[ɬ] after front vowel	5τ	7ς	0
[əɬ]	0	24ς	0
[ɬ] after back vowel	9τς	0	0

In sum, coda *s* is mostly produced as target-like (96% of BF's productions). Her productions do not reflect transfer ([s] → [ʔ] in loanword adaptation). BF is a strategic learner: she has acquired coda *s*: deleting or substituting another segment for *s* is too costly; errors will be easily detected. Coda *l*, in contrast, is rarely produced as target-like (12% of BF's productions). Most error patterns can be explained by BF being a strategic learner; fewer are explained by transfer.

Despite BF's lower proficiency in English, she shows similar patterns of behavior to S11: high accuracy rates on coda *s*; low accuracy rates on coda *l*, with repairs for *l* that will likely go undetected by English-speaking interlocutors. Given the differences in proficiency between BF and S11, it appears that strategic learning need not be correlated with high proficiency.

5 Study IV

5.1 Context

In Study IV, we examine productions from a Japanese-speaking L2er of English, who native speakers of English characterize as speaking slightly slowly and clearly enunciating her words, akin to *clear speech.* In the phonetics literature, it has been observed that speakers modulate their speech, depending on the communicative needs of listeners (e.g., Lindblom, 1990). In contexts demanding clear speech, speakers employ slower speech rates and are thereby more faithful to articulatory targets, ensuring that contrasts between segments are enhanced. Even though L2ers may have difficulty reliably reaching native-like articulatory targets, researchers have found that they too employ clear speech in their second language productions (e.g., Granlund, Baker, & Hazan, 2011; Smiljanic & Bradlow, 2009).

Clear speech is deemed to be listener-oriented. In this study, we explore the possibility that, in the L2 context, it may also be speaker-oriented. We analyze the Japanese speaker's English codas which, on the face of it, appear to be produced in target fashion. Closer scrutiny, however, reveals that they are not actually on target, that they instead employ strategies drawn from the L1 grammar.

5.2 Method

The data analyzed come from JF, a Japanese-speaking professional, using audio recordings from an 11-minute long interview. Production data were narrowly transcribed; preliminary acoustic analysis was undertaken in Praat (Boersma & Weenink, 2024). JF self-assessed as a near-native speaker of English. She started learning English at age 12; she has spent 25 years living in English-speaking countries; and she speaks English at her job and with her spouse.

5.3 Results and discussion

Our focus is on word-final singleton codas, as the range of consonants found in this position in English is quite extensive. Japanese, in contrast, has severe constraints on word-final codas: only [ŋ] is permitted (e.g., Kubozono, 1999; Kuroda, 1965).

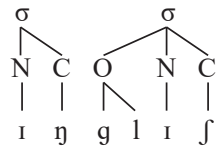
JF produces a large range of English codas, seemingly in target fashion. A closer analysis, however, reveals that they are not on target. Singleton codas are commonly produced as long. Stops (regardless of voicing) are followed by a high intensity release burst and turbulent or non-turbulent noise, which we transcribe as [^{h}]. Vowel epenthesis is also occasionally observed. Examples of these patterns are provided in Table 7.

Table 7. Error patterns for word-final singleton codas in JF's productions

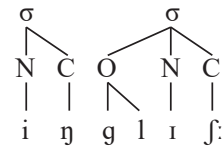
Long consonant	**Long consonant + long burst**	**Short consonant + long burst**	**Long consonant + epenthetic vowel**
[iŋglɪʃʃ] 'English'	[dɪdd^{h}] 'did'	[ðæt^{h}] 'that	[ʤʌpænnɐ] 'Japan'
[faivv] 'five'	[spokk^{h}] 'spoke'	[sɑrdɪd^{h}] 'started'	[taimmə] 'time'
[wʌzz] 'was'	[bækk^{h}] 'back'	[jɔˈk^{h}] 'York'	[ʤæpani.izzɐ] 'Japanese'

To delve into the patterns in Table 7, we begin with duration: Why does JF produce word-final coda consonants as long? We consider two options. Option 1 proposes that JF has the target representation for English codas, shown in (8a) for the word 'English'.

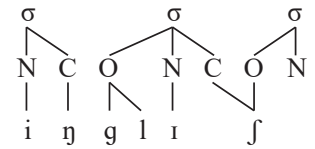
(8) a. Target representation: [ɪŋglɪʃ]



b. JF – Option 1: [iŋglɪʃː]



c. JF – Option 2: [iŋglɪʃʃ]



On this analysis, the added duration realized on final consonants is purely articulatory: it provides more time for JF to reach coda targets. To emphasize that JF's productions have the same representation as the target grammar under Option 1, we transcribe the final long consonant in (8b) as [ʃː], rather than as [ʃʃ] (cf. Table 7).

A challenge for Option 1 is that it cannot explain why added duration and high intensity release burst are simultaneously observed, as in [dɪdː^{h}], for example, in the second column of

Table 7. Another challenge is that if the long consonant is syllabified as a coda, Option 1 cannot explain why a long coda is sometimes followed by an epenthetic vowel, as in [ʤʌpænnɐ] in the fourth column of Table 7.

In view of these challenges, we consider an alternative analysis, Option 2 in (8c). Option 2 proposes that JF syllabifies final long consonants as geminates. Under this analysis, we transcribe the final consonant as doubled ([ʃʃ]), to highlight that it is syllabified as coda+onset, in contrast to coda alone.

We will argue in favor of Option 2, but there are several issues that must be addressed to fully motivate this analysis. The first issue we consider is the distribution of geminates in Japanese. Since Japanese has no final geminates, under Option 2, it must be that JF has repurposed her grammar of *medial* geminates to represent English word-final codas. If we consider both native and loan words in Japanese, the inventory of medial geminates is extensive (e.g., Aoki, 1981; Itô & Mester, 1989; Kubozono, Itô, & Mester, 2009; Lovins, 1975); (9a-c) lists those whose quality closely overlaps with English word-final codas. There are some gaps, for example *ll and *rr, for segments that are unattested (e.g., *l*, which is adapted as *r* in loanwords) or for segments whose syllabification is restricted (e.g., *r* cannot geminate). Clearly, though, the inventory of Japanese codas from geminates provides a much closer match for English word-final codas than does the inventory of Japanese word-final codas.

(9) Word-medial geminates in Japanese:
   a. voiceless obstruents: pp, tt, tt͡ɕ, kk, ɸɸ, ss, ɕɕ
   b. voiced obstruents: bb, dd, dd͡ʑ, ɡɡ, zz
   c. nasals: mm, nn

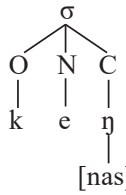
A second issue concerns precisely this mismatch in Japanese: How are codas in word-medial geminates able to bear so many features, in contrast to word-final codas? To explain this, we turn to the theory of Prosodic Licensing, which states that all phonological units must belong to higher prosodic structure (Itô, 1986, 1989); for example, segments and the features they contain must be organized by syllables. Licensing potential is asymmetrical (e.g., Harris, 1997; Piggott, 1999): within syllables, onsets are strong licensers, and codas are weak licensers. Feature sharing, however, as holds for [ʃʃ] in (8c), is a workaround: it enables codas to bear features that they cannot license (e.g., Beckman, 2013; Goldsmith, 1990; Lombardi, 1990).

In Japanese, codas are particularly weak (e.g., Itô, 1986; Itô, Mester, & Padgett, 1995; Kawasaki, 1999): they can only license the feature [nasal]. Consequently, word-internal codas in non-geminate clusters are limited to nasals that must share place features with the following onset (e.g., [amba] ‘pommel horse’; [anda] ‘a hit in baseball’; Kubozono, 2015: 10); word-final codas which, as mentioned, are limited to [ŋ], are typically considered to be placeless,[6] as

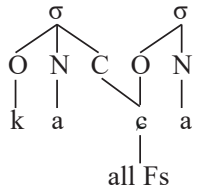
[6] Placeless nasals are often transcribed as [ŋ]. This is because the lowering of the velum required for nasal airflow creates a narrowing in the dorsal region. There is, though, no real oral closure in this region (thus, no place feature)

shown in (10a). Onsets, in contrast, are strong licensers: they can license the full range of features for voice, place and manner of articulation found in Japanese. All features present in geminates are shared between the onset and preceding coda (e.g., Hayes, 1989; McCarthy, 1986; Schein & Steriade, 1986). Codas in geminates can thus bear a large range of features (Fs) when they are shared with and thus licensed by the following onset, as shown in (10b).

(10) a. Word-final coda: [keŋ] 'sword'



b. Word-medial geminate: [kaɕɕa] 'pulley'



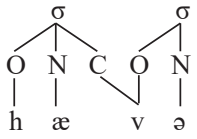
A third issue concerns the location of geminates in a word and consequences this has for their syllabification. As per Option 2, we have proposed that JF's final codas in English are actually geminates, but her native Japanese grammar restricts geminates to word-medial position. How do we arrive at a geminate representation for word-final codas in English, given the starting point of word-medial geminates?

We adopt the view that geminates are always syllabified as coda+onset, regardless of whether they appear in medial or final position (in the spirit of Kaye, 1990; cf. Kraehenmann, 2001). If this holds, the second half of a geminate (the onset position) must always be followed by a nucleus to yield a well-formed syllable, as shown in the various productions for English 'have' and 'cap' in (11). In (11a), geminate [vv] appears in medial position, like in Japanese, because the final nucleus is filled with an epenthetic vowel. This type of production is observed for fricatives and nasals in JF's productions (see examples in fourth column in Table 7). In (11b), the geminate appears in final position because the following nucleus remains empty, as proposed for independent reasons in Government Phonology (e.g., Kaye, 1990). This type of production is observed for fricatives in JF's productions (see examples in first column in Table 7). In (11c), the geminate is produced with a strong release burst, which has been documented in earlier research on the L2 acquisition of English (Goad, 2002; Heyer, 1986; Hodne, 1985; Prator & Robinett, 1972); in Goad (2002), the burst is proposed to be hosted by and thereby shared with the following nucleus, as shown here. This type of production is observed for stops in JF's productions (see examples in second column in Table 7). This representation also predicts that a burst can follow a non-geminate final consonant, which will be syllabified as a singleton onset followed by a nucleus which hosts the burst, shown in (11d). This type of production is similarly observed for stops in JF's productions (see examples in third column in Table 7).

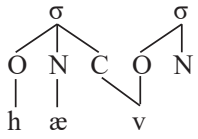
(McCarthy, 2008). Consistent with this, in Japanese, they are sometimes represented as nasal vocoids (e.g., Ṽ in Kuroda, 1965: 202).

(11) Alternative productions for English ‘have’ and ‘cap’:

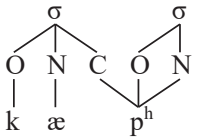
a. Medial geminate: [hævvə]



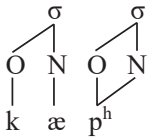
b. Final geminate: [hævv]



c. Burst after geminate: [kæpp^{h}]



d. Burst after onset: [kæp^{h}]



Finally, we must discuss whether the patterns for codas that we have detailed suggest that JF is a strategic learner. The errors observed for final codas will likely go undetected by English-speaking interlocutors. Instead, JF is perceived by native speakers to speak slightly slowly, but to clearly enunciate her words, as mentioned above. In an earlier study, Tajima et al. (2002) find that slower speech rate and higher rates of epenthesis are correlated for Japanese-speaking learners of English which, along with our results, suggest clear speech. Earlier, though, we pointed out that clear speech is considered to be listener-oriented: speakers adjust their speech, depending on the communicative needs of listeners. In this study, we have shown that clear speech may also be speaker-oriented: learners like JF use syllabification strategies to yield segmentally more faithful outputs when coming from an L1 grammar that highly restricts the features licensed in word-final codas. The solution to draw on the L1 grammar of geminates, we contend, is highly strategic.

6 General discussion and conclusions

We have shown that learners are strategic. They use their L1 grammar to optimize target-like production of non-native consonants at the right edge of words, both inflectional morphology and codas, when errors would go undetected by English-speaking interlocutors. They adapt their L1 grammar when errors are too costly, that is, when they would be easily identified.

Study I focused on production of agreement morphology. We showed that one group of learners, the variable deletion group, is strategic: L2ers in this group use their L1 representation for inflection in English when possible (namely, after short stems), enabling them to produce inflection ‘correctly’ about half of the time. Both groups of learners reliably produce coda clusters and singleton coda *s* in monomorphemic words. However, neither of these constructions help with the production of inflection for the less strategic ATB deletion group, as this group has no means to represent and thus produce inflection with the grammar they have built for English.

Studies II and III demonstrated that L2 learners can be strategic when faced with codas that are not present in their L1 grammar. L2ers in both studies were shown to adapt the L1 grammar for coda *s* when repairs involving substitution or deletion would be too costly and likely be detected by English-speaking interlocutors. In contrast, learners attend less to optimizing production when errors would be less costly, leading to substitution and deletion in

the case of coda *l*. The latter patterns were observed even in Study II, where the L2er under focus was misidentified by some listeners as a native speaker of English.

We observed that errors for coda *l* can be undetected by English-speaking interlocutors because coda *l* is velarized in most varieties and, thus, perceptually close to a back vowel. However, coda *l* is not velarized in all varieties of English, not in Irish English, for example. It remains to be seen what repairs learners adopt when exposed to this variety, perhaps epenthesis of an [i]-like vowel, and whether such a repair would be detected more easily by English-speaking interlocutors than repairs documented for velarized *l*.

Study IV showed that learners can repurpose L1 representations (word-medial geminates) for final codas. Phonetic consequences of the syllabification adopted (added duration, large release bursts) are not interpreted by English-speaking interlocutors as heavily accented, but instead they identify the L2er as someone whose productions resemble clear speech.

Studies I and IV demonstrated that probing prosodic representation is critical to understanding the patterns that L2ers' display at the right edge of words. In Study I, the prosodic representation of inflection in Mandarin versus English was crucial to understanding what underlies differences in the suppliance of inflection across the two groups of learners, why variation was tied to stem length, and how performance on clusters and coda *s* in monomorphemic words did not help learners in the ATB deletion group with inflectional *s*. In Study IV, the proposal that learners repurpose their word-internal representation of geminates for word-final codas in English could only be considered if one adopts a structured approach to the syllable, asymmetries in the licensing potential of onsets versus codas, and the possibility that syllables may contain empty nuclei under some conditions.

Overall, we have found that strategic learners produce target-*sounding* forms at the right edge of words, by identifying when and how to draw on the L1 grammar. However, we have not addressed the question of what enables a learner to be strategic. We observed through the productions of BF (Study III), as compared to those of S11 (Study II) and JF (Study IV), that it is not necessarily native-like proficiency. Perhaps, instead, strategic learners have high metalinguistic awareness, which enables them to effectively tap into and compare their native language grammar with patterns they have identified in the L2. We leave this question to future research.

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References

Aoki, P. K. (1981). *Gemination in Japanese.* [Unpublished doctoral dissertation]. University of Washington.

Austin, G., Chang, H., Kim, N., & Daly, E. (2022). Prosodic transfer across constructions and domains in L2 inflectional morphology. *Linguistic Approaches to Bilingualism, 12,* 657–686. https://doi.org/10.1075/lab.19076.aus

Bayley, R. (1996). Competing constraints on variation in the speech of adult Chinese learners of English. In R. Bayley & D. Preston (Eds.), *Second language acquisition and linguistic variation* (pp. 97–120). Benjamins. https://doi.org/10.1075/sibil.10.05bay

Beckman, J. (2013). *Positional faithfulness: An optimality theoretic treatment of phonological asymmetries.* Routledge. https://doi.org/10.4324/9780203055427

Boersma, P., & Weenink, D. (2024). Praat: Doing phonetics by computer. http://www.praat.org/

Bruhn de Garavito, J. (2008). Acquisition of the Spanish plural by French L1 speakers: The role of transfer. In J. Liceras, H. Zobl, & H. Goodluck (Eds.), *The role of features in second language acquisition* (pp. 271–298). Lawrence Erlbaum. https://doi.org/10.4324/9781315085340

Chang, C. B. (2009). English loanword adaptation in Burmese. *Journal of the Southeast Asian Linguistics Society, 1,* 77–94.

Duanmu, S. (2007). *The phonology of Standard Chinese* (2nd ed). Oxford University Press. https://doi.org/10.1093/oso/9780199215782.001.0001

Goad, H., White, L., & Bruhn de Garavito, J. (2011). Prosodic transfer at different levels of structure: The L2 acquisition of Spanish plurals. In *Proceedings of the 35th Annual Boston University Conference on Language Development: Online Proceedings Supplement.* http://www.bu.edu/bucld/files/2011/05/35-Goad-White-Bruhn-de-Garavito.pdf

Goad, H. (2002). Markedness in right-edge syllabification: Parallels across populations. *Canadian Journal of Linguistics, 47*(3–4), 151–186. https://doi.org/10.1017/S0008413100022933

Goad, H., & White, L. (2004). Ultimate attainment of L2 inflection: Effects of L1 prosodic structure. In S. Foster-Cohen, M. Sharwood Smith, A. Sorace, & M. Ota (Eds.), *EUROSLA Yearboo*k 4 (pp. 119–145). Benjamins. https://doi.org/10.1075/eurosla.4.07goa

Goad, H., & White, L. (2006). Ultimate attainment in interlanguage grammars: A prosodic approach. *Second Language Research, 22*(3), 243–268. https://doi.org/10.1191/0267658306sr268oa

Goad, H., & White, L. (2019). Prosodic effects on L2 grammars. *Linguistic Approaches to Bilingualism, 9,* 769–808. https://doi.org/10.1075/lab.19043.goa

Goad, H., White, L., & Steele, J. (2003). Missing inflection in L2 acquisition: Defective syntax or L1-constrained prosodic representations? *Canadian Journal of Linguistics, 48*(3–4)*,* 243–263. https://doi.org/10.1017/S0008413100000669

Goldsmith, J. A. (1990). *Autosegmental and metrical phonology.* Blackwell.

Granlund, S., Baker, R., & Hazan, V. (2011). Acoustic-phonetic characteristics of clear speech *in bilinguals. Proceedings of the 17th International Congress of Phonetic Sciences (ICPhS XVII)* (pp. 763–766). International Phonetic Association.

Green, A. D. (2005). Word, foot, and syllable structure in Burmese. In J. Watkins (Ed.), *Studies in Burmese linguistics* (pp. 1–25). Pacific Linguistics. https://doi.org/10.15144/PL-570.1

Hansen, J. G. (2001). Linguistic constraints on the acquisition of English syllable codas by native speakers of Mandarin Chinese. *Applied Linguistics, 22*(3), 338–365. https://doi.org/10.1093/applin/22.3.338

Harris, J. (1994). *English sound structure.* Blackwell.

Harris, J. (1997). Licensing inheritance: An integrated theory of neutralisation. *Phonology, 14*(3), 315–370. https://www.jstor.org/stable/4420108

Hawkins, R., & Chan, C. Y.-h. (1997). The partial availability of Universal Grammar in second language acquisition: The 'failed functional features hypothesis'. *Second Language Research, 13*(3), 187–226. https://doi.org/10.1191/026765897671147

Hayes, B. (1986). Inalterability in CV phonology. *Language, 62*(2), 321–351. https://doi.org/10.2307/414676

Heyer, S. C. (1986). *English final consonants and the Chinese learner.* [Unpublished master's thesis]. Southern Illinois University.

Hodne, B. (1985). Yet another look at interlanguage phonology: The modification of English syllable structure by native speakers of Polish. *Language Learning, 35*(3), 405–417. https://doi.org/10.1111/j.1467-1770.1985.tb01084.x

Itô, J. (1986). *Syllable theory in prosodic phonology.* [Unpublished doctoral dissertation]. University of Massachusetts, Amherst.

Itô, J. (1989). A prosodic theory of epenthesis. *Natural Language & Linguistic Theory, 7*(2), 217–259. https://doi.org/10.1007/BF00138077

Itô, J., & Mester, R. A. (1989). Feature predictability and underspecification: Palatal prosody in Japanese mimetics. *Language,* 65, 258–293. https://www.jstor.org/stable/415333

Itô, J., & Mester, R. A. (2015). Sino-Japanese phonology. In H. Kubozono (Ed.), *Handbook of Japanese phonetics and phonology* (pp. 289–312). Mouton de Gruyter. https://doi.org/10.1515/9781614511984.289

Itô, J., Mester, R. A., & Padgett, J. (1995). Licensing and underspecification in Optimality Theory. *Linguistic Inquiry, 26*(4), 571–613. http://www.jstor.org/stable/4178915

Jesney, K. (2004). The use of global foreign accent rating in studies of L2 acquisition. [Unpublished manuscript]. University of Calgary.

Kawasaki, T. (1999). *Coda constraints – Optimizing representations.* [Unpublished doctoral dissertation]. McGill University.

Kaye, J. D. (1990). 'Coda' licensing. *Phonology, 7*(2), 301–330. doi:10.1017/S0952675700001214

Kent, R. D. (1992). The biology of phonological maturation. In C. A. Ferguson, L. Menn, & C. Stoel-Gammon (Eds.), *Phonological development: Models, research, implications* (pp. 65–90). York Press.

Kraehenmann, A. (2001). Swiss German stops: Geminates all over the word. *Phonology, 18*(1), 109–145. https://doi.org/10.1017/S0952675701004031

Kubozono, H. (1999). Mora and syllable. In N. Tsujimura (Ed.), *The Handbook of Japanese Linguistics* (pp. 31–61). Blackwell. https://doi.org/10.1002/9781405166225.ch2

Kubozono, H. (2015). Introduction to Japanese phonetics and phonology. In H. Kubozono (Ed.), *Handbook of Japanese phonetics and phonology* (pp. 1–40). De Gruyter Mouton. https://doi.org/10.1515/9781614511984.1

Kubozono, H., Itô, J., & Mester, R. A. (2009). Consonant gemination in Japanese loanword phonology. In *Current issues in unity and diversity of languages. Collection of papers selected from the 18th International Congress of Linguists* (pp. 953–973). Dongam.

Kuroda, S.-Y. (1965). *Generative grammatical studies in the Japanese language.* [Unpublished doctoral dissertation]. MIT.

Labov, W., Ash, S., & Boberg, C. (2008). *The atlas of North American English: Phonetics, phonology and sound change.* Walter de Gruyter.

Lardiere, D. (1998). Dissociating syntax from morphology in a divergent end-state grammar. *Second Language Research, 14*(4), 359–375. https://doi.org/10.1191/026765898672500

Lardiere, D. (2003). Second language knowledge of [±past] vs. [±finite]. In J. Liceras, H. Zobl & H. Goodluck (Eds.), *Proceedings of the 6th Generative Approaches to Second Language Acquisition Conference (GASLA 2002): L2 Link*s (pp. 176–189). Cascadilla.

Lindblom, B. (1990). Explaining phonetic variation: A sketch of the H&H theory. In W. J. Hardcastle & A. Marchal (Eds.), *Speech production and speech modeling* (pp. 403– 439). Kluwer.

Lombardi, L. (1999). Positional faithfulness and voicing assimilation in Optimality Theory. *Natural Language & Linguistic Theory, 17*(2), 267–302. https://doi.org/10.1023/A:1006182130229

Lovins, J. B. (1975). *Loanwords and the phonological structure of Japanese.* Indiana University Linguistics Club.

McCarthy, J. J. (1986). OCP effects: Gemination and antigemination. *Linguistic Inquiry, 17*(2), 207–263. https://www.jstor.org/stable/i390223

McCarthy, J. J. (2008). The gradual path to cluster simplification. *Phonology, 25*, 271–319. doi:10.1017/S0952675708001486

Nespor, M., & Vogel, I. (1986). *Prosodic phonology.* Foris.

Piggott, G. L. (1999). At the right edge of words. *The Linguistic Review, 16*(2), 143–185. https://doi.org/10.1515/tlir.1999.16.2.143

Prator, C. H., & Robinett, B. W. (1972). *Manual of American English pronunciation* (3rd ed). Holt, Rinehart and Winston.

Prévost, P., & White, L (2000). Missing surface inflection or impairment in second language acquisition? Evidence from tense and agreement. *Second Language Research, 16*(2), 103–133. https://doi.org/10.1191/026765800677556

Romero, J. (1995). An articulatory view of historical S-aspiration in Spanish. *Rivista di Linguistica, 7,* 191–208.

Ruffner, P. (2000). Epenthesis and fricatives in final consonant clusters. *Working Papers, George Mason University Linguistics Club, 7,* 15–31. https://orgs.gmu.edu/lingclub/WP/texts/7_Ruffner.pdf?gmuw-rd=sm&gmuw-rdm=ht

Schein, B., & Steriade, D. (1986). On geminates. *Linguistic Inquiry, 17*(4), 691–744. https://www.jstor.org/stable/4178513

Selkirk, E. O. (1996). The prosodic structure of function words. In J. Morgan & K. Demuth (Eds.), *Signal to syntax: Bootstrapping from speech to grammar in early acquisition* (pp. 187–213). Erlbaum.

Shadle, C. H. (1991). Source parameters for the fricative consonants /s, ʃ, ç, x/. *Journal of the Acoustical Society of America, 89*(4B): 1893. https://doi.org/10.1121/1.2029412

Smiljanic, R., & Bradlow, A.R. (2009). Native and nonnative clear speech production. *Journal of the Acoustical Society of America, 125*(4), 2753. https://doi.org/10.1121/1.4784610

Tajima, K., Erickson, D., & Nagao, K. (2002). Production of syllable structure in a second language: Factors affecting vowel epenthesis in Japanese-accented English. *IULC Working Papers. Speech prosody and timing: Dynamic aspects of speech, 2*(2), 77–91. https://scholarworks.iu.edu/journals/index.php/iulcwp/article/view/25890

Toda, M., Maeda, S., & Honda, K. (2010). Formant-cavity affiliation in sibilant fricatives. In S. Fuchs, M. Toda, & M. Zygis (Eds.), *Turbulent sounds: An interdisciplinary guide* (pp. 343–374). Mouton de Gruyter. https://doi.org/10.1515/9783110226584.343

Watkins, J. W. (2011). Illustrations of the IPA: Burmese. *Journal of the International Phonetic Association, 31*(2), 291–295. https://doi.org/10.1017/S0025100301002122

Wolfram, W., & Hatfield, D. (1984). *Tense marking in second language learning: Patterns of spoken and written English in a Vietnamese community.* Washington, DC: Center for Applied Linguistics.

Wright, R. (2004). A review of perceptual cues and cue robustness. In B. Hayes, R. Kirchner, & D. Steriade (Eds.), *Phonetically based phonology* (pp. 34–57). Cambridge University Press.

Zhang, S. (2021). *Strategies in the second language acquisition of phonology: A case study of a near-native Mandarin speaker of English.* [Unpublished honours thesis]. McGill University.