Prosodic and segmental challenges in second language acquisition: The case of codas and inflectional morphology in Mandarin-speaking learners of English

Heather Goad
McGill University
Montréal, Québec, Canada
heather.goad@mcgill.ca

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Beijing Language and Culture University
北京语言大学

1. Introduction

Second language learners face challenges learning the syllable structure of the L2 when their L1 grammar is a subset of the language being acquired.

Examples of challenges for Mandarin-speaking learners of English:

• *obstruents in coda:*	[lɪ**p**] *lip*	[bʌ**dʒ**] *budge*
• *clusters in coda:*	[lɪ**mp**] *limp*	[bʌ**ldʒ**] *bulge*
• *inflected forms:*	[lɪ**ps**] *lips*	[bʌ**dʒd**] *budged*
	[lɪ**mpt**] *limped*	[bʌ**ldʒd**] *bulged*

1. Introduction

1. Does acquisition of inflectional suffixes present the same challenges as acquisition of codas in monomorphemic words?

Monomorphemic:		Inflected:	
[wai**z**]	*wise*	[bai**z**]	*buys*
[bai**nd**]	*bind*	[sai**nd**]	*signed*
[tæ**ks**]	*tax*	[tæ**ks**]	*tacks*

- No, production of codas usually precedes production of inflectional suffixes, even when the number and type of segments is controlled.

1. Introduction

2. Why is inflection harder to acquire?
   - Learners must determine how to build the appropriate prosodic structure for inflection.
     - In some languages, inflectional suffixes may look like ordinary codas but further investigation reveals that the prosodic structure is more complex.

1. Introduction

Part of the task of learning inflectional morphemes and their phonological properties in a second language involves:

- Determining the underlying and surface shapes that inflection takes in the *segmental domain*;
- Determining the way that these morphemes are organized in the *prosodic domain* (into prosodic constituents such as syllables, feet and prosodic words).

1. Introduction

Steps involved in determining the underlying and surface shapes that morphemes take in the *segmental domain*:

- Segmenting words into morphemes

  [dɑgz] ‘dogs’ → dɑg + z

- Assigning a unique underlying representation and meaning to each morpheme

  /dɑg/ 

  /z/ ‘plural’

- Determining the rules that regulate the various shapes that a single morpheme can take

  /z/ → [s] after voiceless obstruents ([kæ**t**s] ‘cats’)

  /z/ → [ə**s**] after sibilants (hɔr**s**əz] ‘horses’)

1. Introduction

Steps involved in determining the way that morphemes are organized in the *prosodic domain*:

- Determining constraints on prosodic structure (e.g. syllable structure, stress) for uninflected forms.
- Determining whether inflected forms follow these same constraints.
- Learning to build and produce the prosodic complexity required by the L2 grammar if it is not permitted in the L1 grammar.

1. Introduction

- Well after the stage when the underlying and surface shapes of inflectional morphemes have been acquired (segmental domain), learners struggle with how to appropriately organize them into prosodic structure (prosodic domain);
  - *Evidence:* Asymmetries in the contexts in which these morphemes are produced.

- Well after the stage when the segmental complexity required to produce inflected words has been acquired in monomorphemic words, learners continue to struggle with inflected words of the same segmental profile;
  - *Evidence:* Better performance on monomorphemic words than on inflected words that are similar in shape.

2. Inflectional Morphology in L2 English

Common Pattern in L2 Context:

- Inflectional morphology is variably supplied in the productions of L2 speakers when the L1 grammar does not overtly mark the morpheme in question.
- Examples from Patty (L1 Mandarin and Hokkien) (Lardiere 1998, 2003):

3sg agreement:

a. he have the uh, inspiration to say what he want to say
b. everyone who believe it can get it

Past tense:

c. went to school and learn English
d. yeah, Saul gain his sight

2. Inflectional Morphology in L2 English

Earlier literature:

Explains low suppliance of inflection to:

- *Syntax:* Inability to acquire uninterpretable formal features not realized in the L1 grammar (e.g. Hawkins & Chan 1997);
- *Mapping:* Difficulties mapping between syntactic and morphological components of the grammar (Lardiere 1998);
- *Lexical Access:* Difficulties accessing marked forms from the lexicon (e.g. Prévost & White 2000);
- *Lower Level Prosody: Syllable Structure:* L1–L2 differences in syllable structure (e.g. Lardiere 2003).

Present work:

- *Higher Level Prosody: Word Structure:* Difficulties organizing inflection into higher prosodic structure.

2. Inflectional Morphology in L2 English

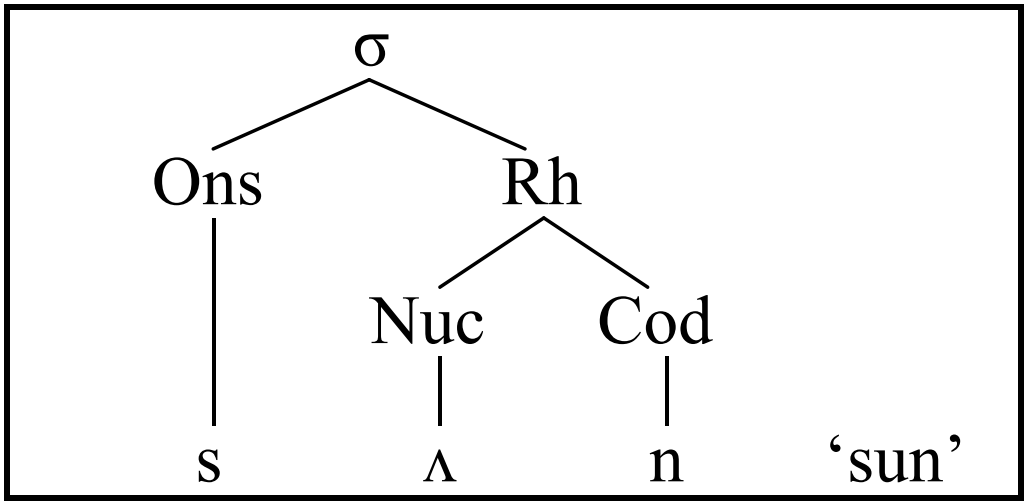
Prosodic Transfer Hypothesis (PTH) (Goad, White & Steele 2003, Goad & White 2004, 2006, 2008):

- Difficulties that learners have with the production of functional morphology (inflection, articles) stem from constraints on prosodic structure that are transferred from the native grammar;
- Functional material may be variably produced or produced in non-target fashion if the necessary prosodic representations are not available in the L1 grammar.

2. Inflectional Morphology in L2 English

Prosodic Structure: Syllables:

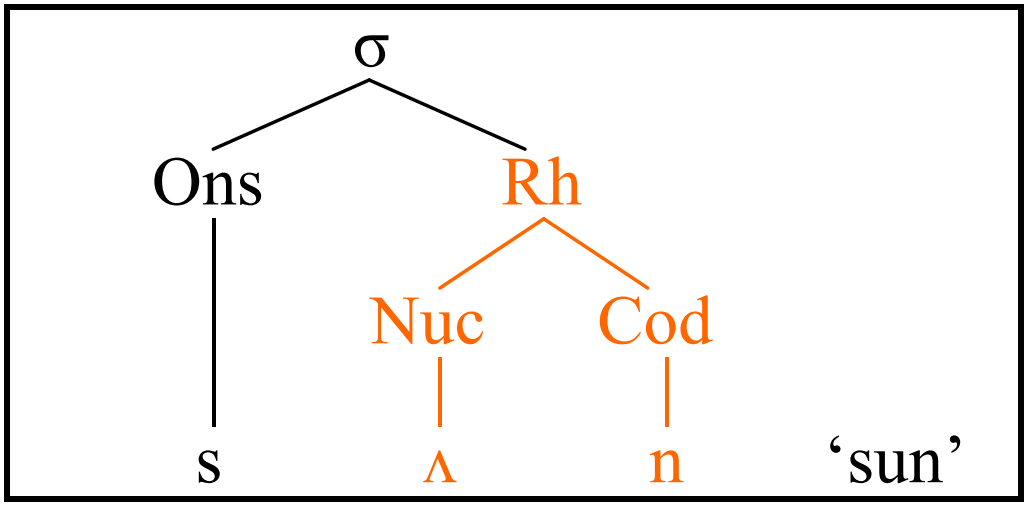
- Syllables (σ) are divided into onsets (Ons) and rhymes (Rh). Rhymes are divided into nuclei (Nuc) and codas (Cod).



2. Inflectional Morphology in L2 English

Prosodic Structure: Syllables:

- Our focus: the rhyme and how many segments it contains.

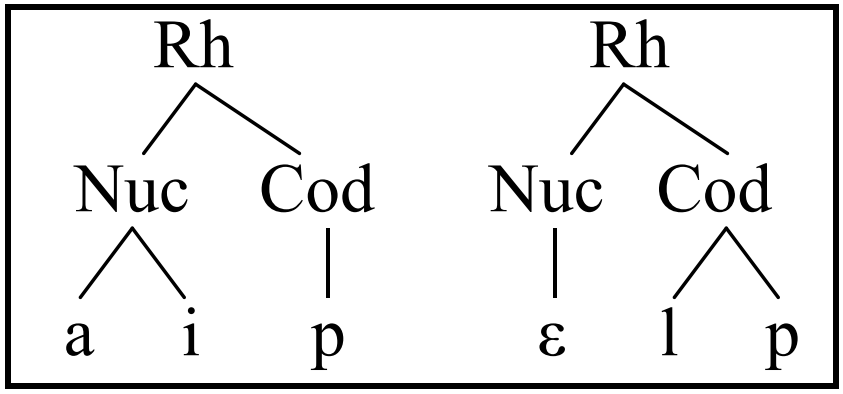


2. Inflectional Morphology in L2 English

Prosodic Structure of Word-final Consonants in English:

- Word-final rhymes in monomorphemic and derived words contain a maximum of three segments:

VVC	[taip]	'type'
	[di:p]	'deep'
VCC	[hɛlp]	'help'
	[dɛp-θ]	'depth'



- Inflectional suffixes violate this constraint:

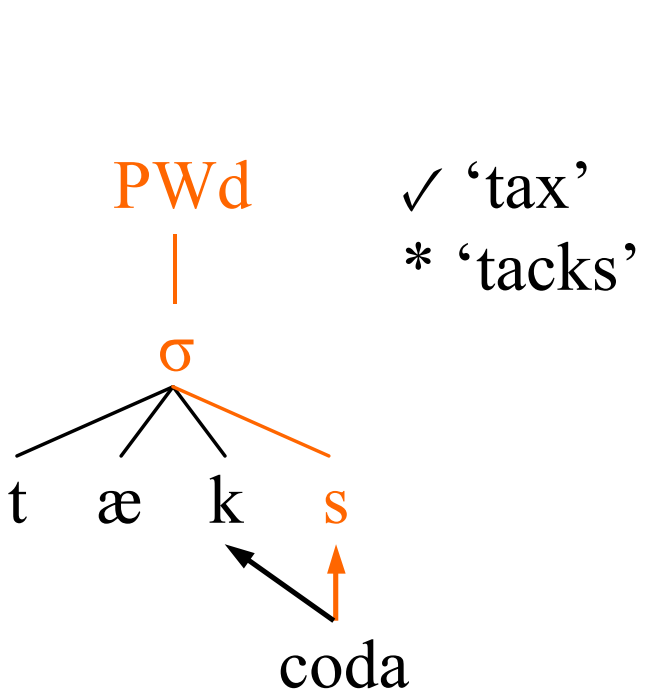
VVCC	[taip-s]	'types'			
VCCC	[hɛlp-t]	'helped'	[dɛp-θ-s]	'depths'	

Conclusion:

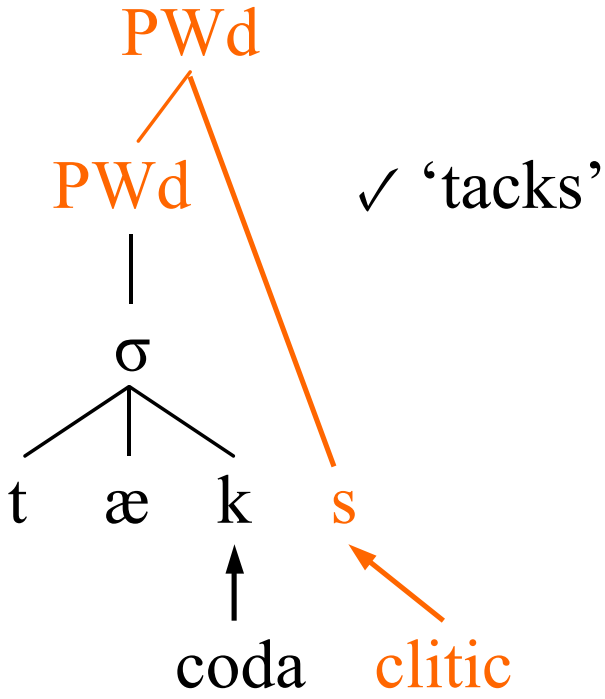
- Inflectional suffixes in English are not ordinary codas…

2. Inflectional Morphology in L2 English

- Inflectional suffixes in English are not organized as *codas* inside the prosodic word (PWd) of the base to which they attach;
- They are organized as *affixal clitics*, outside of the syllable (σ) and PWd of the base:



✓ 'tax'
* 'tacks'



✓ 'tacks'

2. Inflectional Morphology in L2 English

Back to the L2 Context:

- Learners have difficulties appropriately organizing inflectional morphemes into prosodic structure (as per the PTH);
- These difficulties continue to occur after the stage when the underlying and surface shapes of inflectional morphemes have been acquired (segmental domain);
- These difficulties continue to occur after learners can produce the same kind of material in monomorphemic words (e.g. ‘tax’ ✓[tæks] but ‘tacks’ [tæk-s] → [tæk]).

2. Inflectional Morphology in L2 English

Present Focus:

- *Study 1:* Mandarin-speaking learners of English syllable structure constraints;
- *Study 2:* Mandarin-speaking learners of English 3rd singular agreement morphology (builds on Goad, White & Steele 2003).

3. Licensing L1 Segments in New Positions: /l/ in Coda in L2 Mandarin-English

Study 1:

- Do L1 segments straightforwardly transfer to new syllable positions (i.e. coda) in the L2?

Focus:

- Case study of a very advanced Mandarin-speaking learner of British English;
- Acquisition of /l/ and /s/ in coda;
- Narrowly-transcribed spontaneous production data from relatively formal setting.

3. Licensing L1 Segments in New Positions: /l/ in Coda in L2 Mandarin-English

Mandarin Consonants:

	Labial	Alveolar	Retroflex	Prepalatal	Velar
obstruents	p p^h	t t^h			k k^h
		ts ts^h	ʈʂ $ʈʂ^h$	tɕ $tɕ^h$	
		s	ʂ	ɕ	x
sonorants	m	n			ŋ
		l	ɻ		

Mandarin Syllable Structure:

- Maximal syllable: CVV or CVC
- No branching onsets
- Branching rhymes maximally two segments: VV, VG, VC
- Codas: [n, ŋ, ɻ], *[l]

3. Licensing L1 Segments in New Positions: /l/ in Coda in L2 Mandarin-English

SINGLETON ONSET:			
Produced as target [l]			
selected	topicalization	look	Lee
pairless	minimality	value	level
analysis	relative		

SINGLETON CODA:			CODA IN CLUSTER:	
Produced as [ʊ]/[o]			Produced as [ʊ]/[o]	
all	example	contextual	result	multiple
well	multiple	squiggle	also	alternative
level	flexible	possible		
focal	novel	particle		

3. Licensing L1 Segments in New Positions: /l/ in Coda in L2 Mandarin-English

This L2 speaker is using L1 syllable structure constraints to deal with English /l/:

- *Coda /l/, in singletons and branching contexts, produced as [ʊ]/[o]:*
  [wɛl] → [wɛʊ] ~ [wɛo] 'well'
  [ɑlso] → [ɑʊso]~ [ɑoso] 'also'
  - ► Consistent with VV rhymes in Mandarin.

3. Licensing L1 Segments in New Positions: /l/ in Coda in L2 Mandarin-English

Question:

- Why is acquisition of /l/ in coda so late for this very advanced speaker?

Explanation for delayed L1 effects:

- *Substitution in codas:* Coda /l/ in English is velarized, which is perceptually close to [ʊ]/[o].

3. Licensing L1 Segments in New Positions: /l/ in Coda in L2 Mandarin-English

Conclusion for /l/:

- In all cases, errors likely go *unnoticed* by native speakers.
- There is therefore *no motivation (no reason)* for learners to change the grammar to allow this existing L1 segment in new prosodic positions (coda) in the L2.

What about coda /s/? Is it like /l/ or different from /l/?

3. Licensing L1 Segments in New Positions: /l/ in Coda in L2 Mandarin-English

What about coda /s/?

- *Substitution:* There is no suitable substitute for this sound in the Mandarin coda inventory ([n, ŋ, ɻ]);
- *Deletion:* [s] is highly salient: it has strong internal cues for place and manner of articulation, which enables it to be perceived in all contexts (Wright 2004, Toda, Maeda & Honda 2010); deletion will NOT go unnoticed.

Predictions:

- Coda /s/ should be acquired relatively early:
  true for this speaker (/s/ is 100% target-like) and for all speakers in Study 2, who are less advanced.
- But: this does not impact /s/ when inflectional suffix…

4. The Prosodic Organization of Inflection: English and Mandarin

- Regular inflection in English is not organized into the prosodic word (PWd) of its base to which it attaches;
- If it were, we would expect to observe shortening of rhyme when inflectional affix is attached to satisfy constraint that word-final rhymes maximally contain three segments:

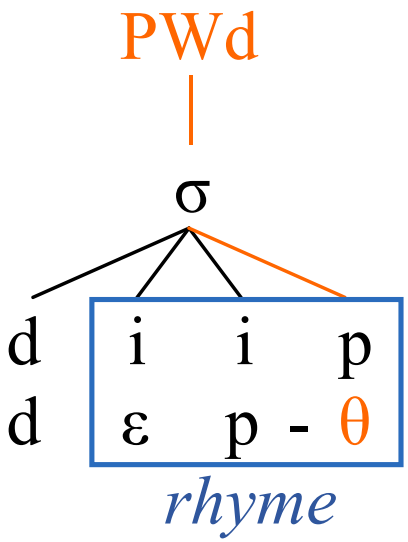
Regular inflection:	[hi:p]	[hi:pt]	*[hɛpt]	‘heap’, ‘heaped’

Compare:				
Derivation:	[di:p]	[dɛpθ]	*[di:pθ]	‘deep’, ‘depth’
Irregular inflection:	[wi:p]	[wɛpt]		‘weep’, ‘wept’

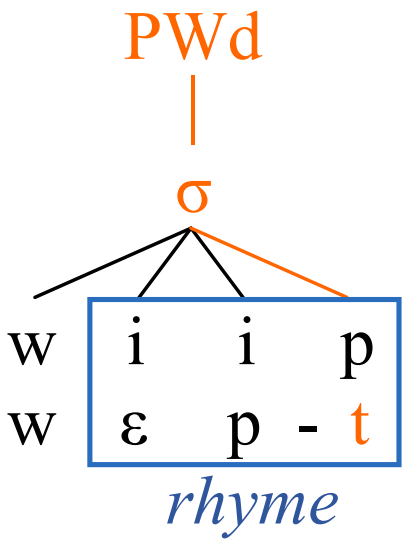
4. The Prosodic Organization of Inflection: English and Mandarin

English:

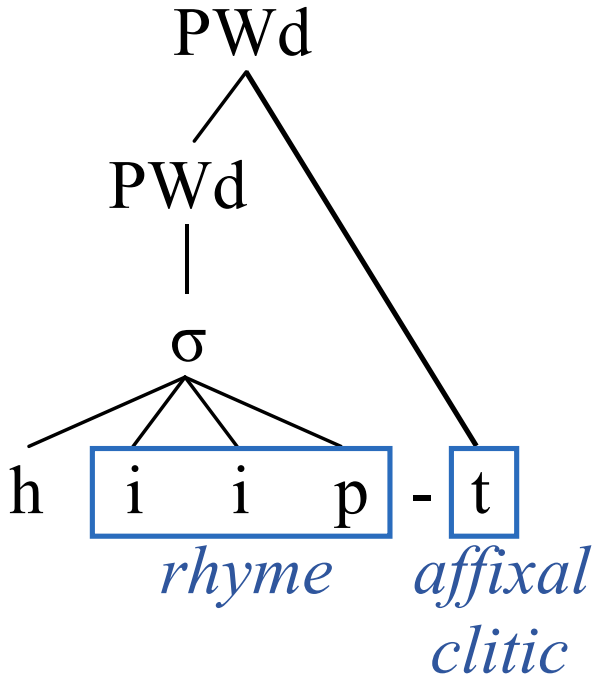
Derivation:



Irregular inflection:



Regular inflection:



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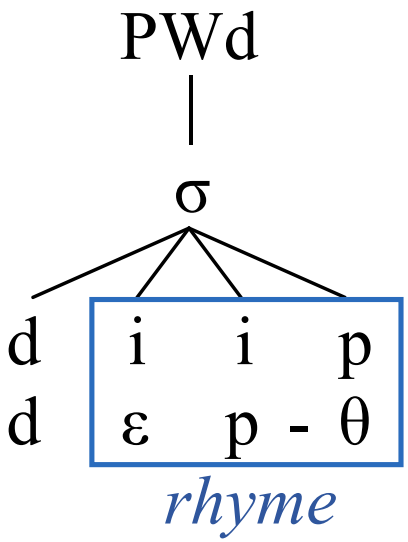
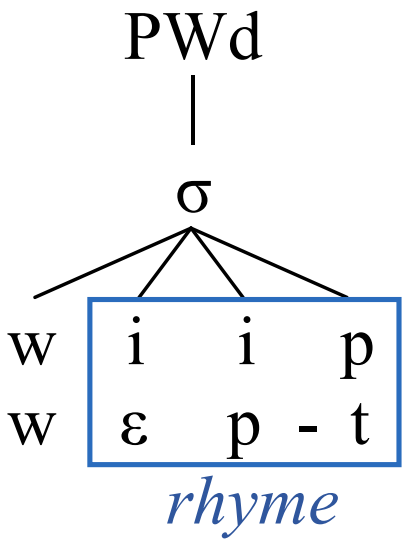


Irregular: inflection:



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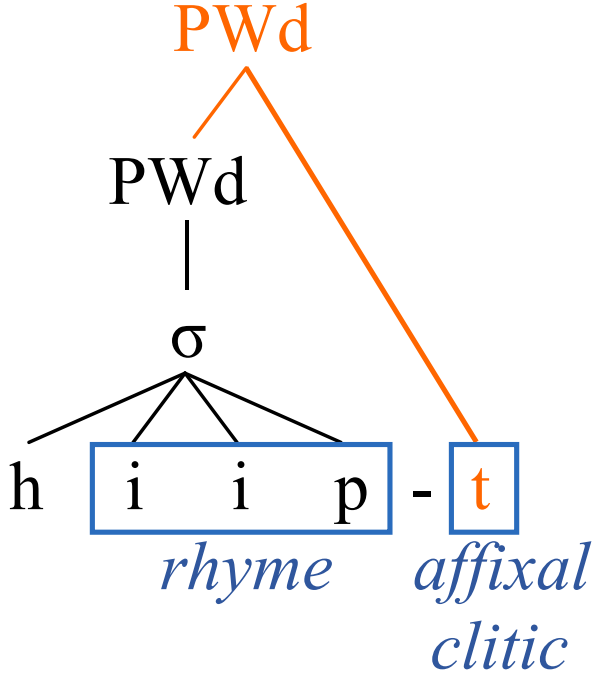
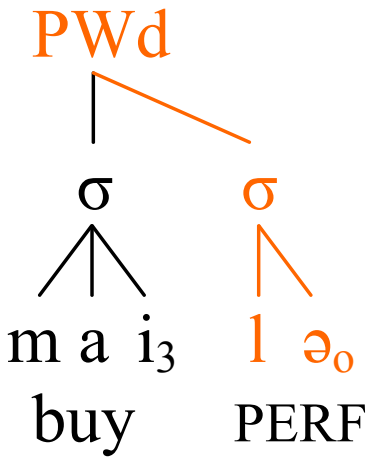


4. The Prosodic Organization of Inflection: English and Mandarin

- Inflection (aspect) in Mandarin is organized inside PWd of the base to which it attaches, as an *internal clitic* (Goad, White & Steele 2003, Goad & White 2006):



'bought already'

5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

Study 2:

- Do Mandarin-speaking learners of English show evidence of prosodic transfer in the L2 acquisition of agreement morphology?
- Is there any link between acquisition of inflectional /s/ and performance on coda /s/?

5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

Focus:

- Twelve Mandarin-speaking learners of Canadian English of high-intermediate/low-advanced proficiency;
- Narrowly-transcribed production data from a story-telling task (Goad, White & Steele 2003).
- Data compares:
  - 3sg agreement inflectional suffix /s,z/ (*she goes* [go:z]) vs. coda /s,z/ in monomorphemic words (*hose* [ho:z])
  - 3sg agreement inflectional suffix in clusters (*he talks* [tɑks], *she comes* [kʌmz]) vs. similar clusters in monomorphemic words (*tax* [tæks], *camp* [kæmp])

5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

For agreement morphology, participants fall into two groups:

- *Across-the-board (ATB) deletion group:* Delete inflection in all contexts;
- *Variable deletion group:* Produce inflection about half of the time; variation depends on the length of the rhyme to which inflection attaches.

5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

Suppliance Rates for 3sg Agreement:

- *Focus*: ATB deletion group:

CONTEXT:	ATB DELETION (n=6):	VARIABLE DELETION (n=6):
After stems ending in short rhymes (VV, VC) ([gou] 'go', [kʌm] 'come', [tɑk] 'talk')	7%	68%
After stems ending in long rhymes (VVC, VCC) ([kli:n] 'clean', [teik] 'take', [θɪŋk] 'think', [kəlɛkt] 'collect')	0%	9%

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5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

Across-the-board Deletion Group:

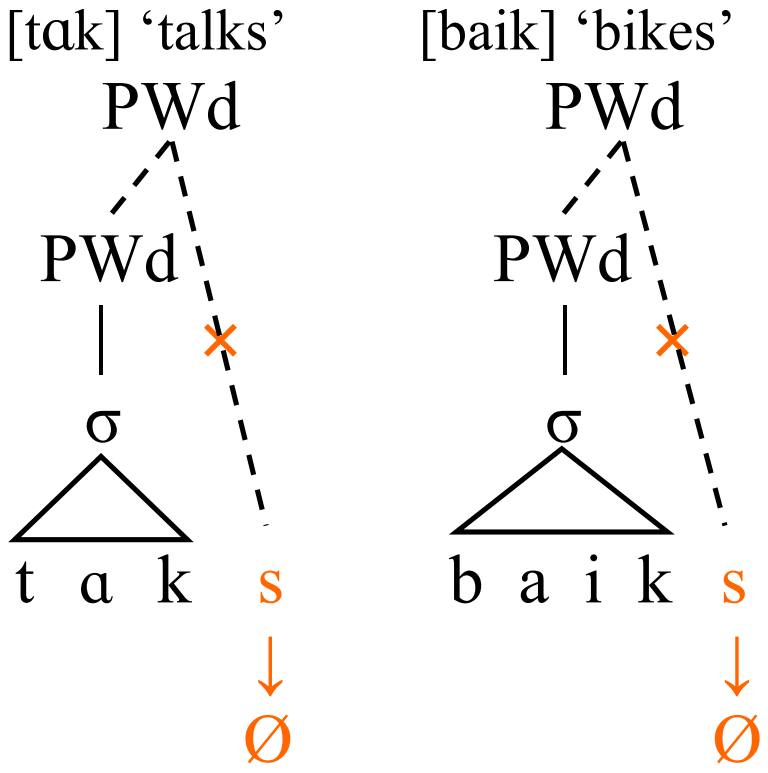
- Learners understand that English is not like Mandarin (it does not permit an analysis of inflection inside the PWd of the base to which it attaches) and are sensitive to the need for a unified analysis of inflection (one analysis for stems of all shapes). However, their grammars do not permit the affixal clitic representation required for English inflection.
- *Result:* ATB deletion of inflection.

Variable Deletion Group:

- Inflectional morphology surfaces for stimuli where it can be organized inside the PWd of the base to which it attaches (as in Mandarin), without violating syllable structure well-formedness for English (maximally three segments in the rhyme).
- *Result:* Variable deletion of inflection, but variability is predictable from stem length.

5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

ATB Deletion Group:



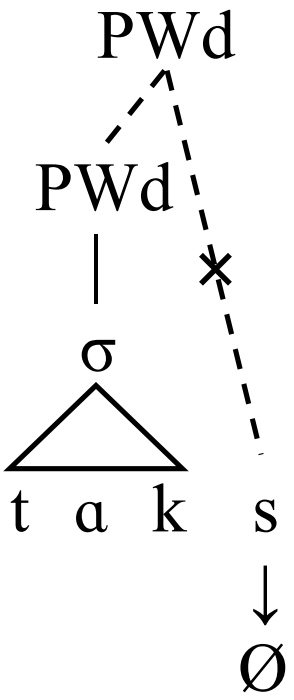
Suppliance rates:

7% 0%

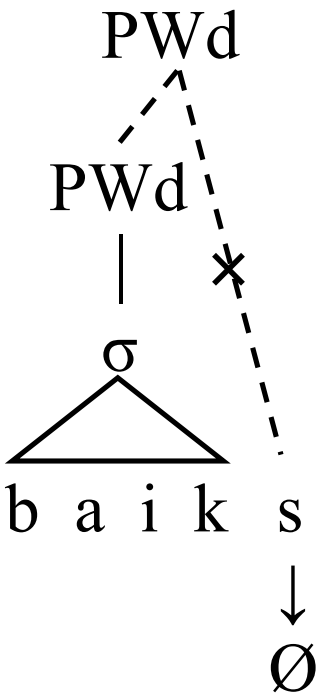
5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

ATB Deletion Group:

[tɑk] 'talks'

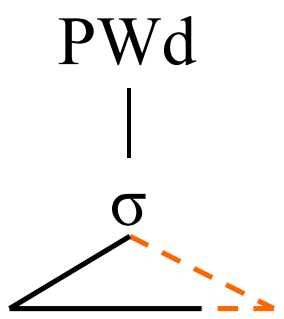


[baik] 'bikes'

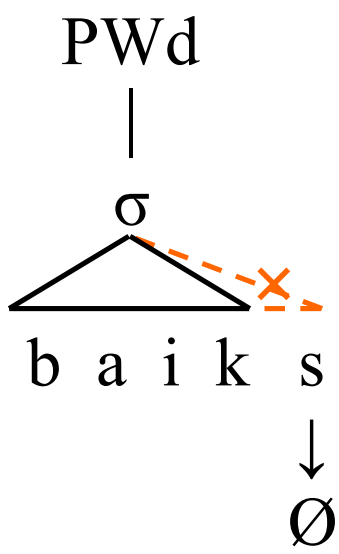


Variable Deletion Group:

[tɑks] 'talks'



[baik] 'bikes'



Suppliance rates:

7%	0%	68%	9%

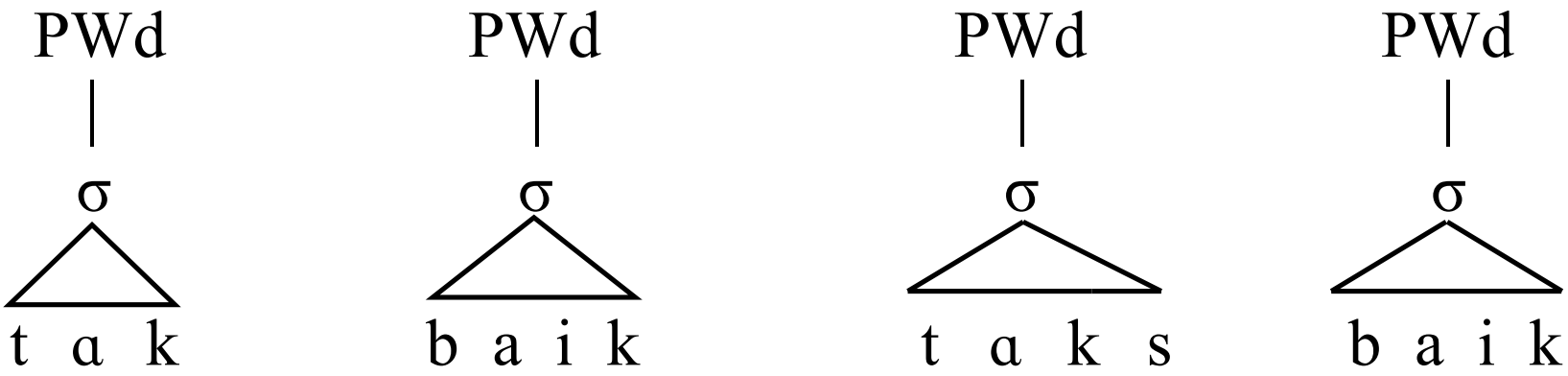
5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

ATB Deletion Group:

[tɑk] ‘talks’ [baik] ‘bikes’

Variable Deletion Group:

[tɑkt] ‘talks’ [baik] ‘bikes’



Suppliance rates:

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5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

What about syllable structure constraints?

Perhaps high deletion of 3sg agreement is not due to prosodic transfer of L1 representation for inflection but is instead due to prosodic transfer of syllable structure constraints…

Mandarin syllable structure revisited:

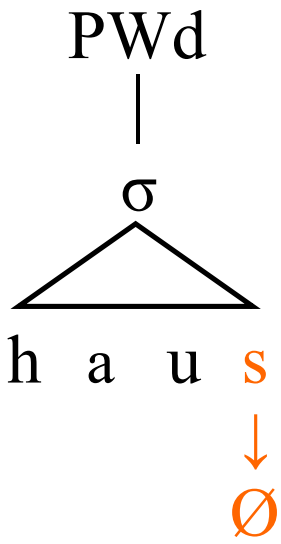
- /s/ is well-formed in onset position;
- /s/ is ill-formed in coda position;
- Coda clusters are forbidden.

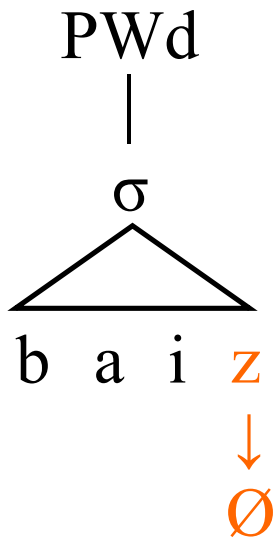
5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

Forms ending in singleton /s,z/: Possible analysis:

Monomorphemic:
[haus] 'house'

Inflected:
[baiz] 'buys'





Prediction:
Deletion rate of /s,z/
same for both contexts

5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

What about singleton /s/ in monomorphemic words?

Production of word-final singleton /s/ in monomorphemic words:

ATB Deletion Group		Variable Deletion Group	
Target-like	92%	Target-like	93%
Deletion	2%	Deletion	0%
Epenthesis	6%	Epenthesis	7%

(all tables: targeted segments occur before C or pause; voicing errors ignored)

Interpretation:

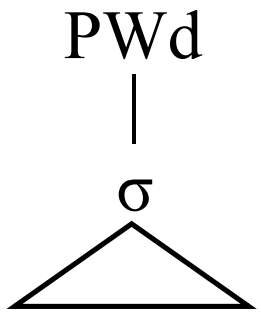
- Coda /s/ has been acquired for both groups;
- Errors (e.g. deletion, substitution) in the production of coda /s/ – unlike coda /l/ – will NOT go unnoticed in L2 productions because of the high salience of this segment;
- The fact that /s/ is an ill-formed coda in Mandarin cannot be the solution for deletion of 3sg agreement morphology.

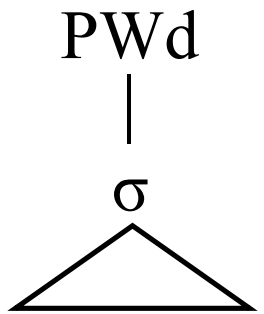
5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

Forms ending in clusters: Possible analysis:

Monomorphemic:
[pʌls] ‘pulse’

Inflected:
[pʊlz] ‘pulls’





Prediction:
Deletion rate of /s,z/
same for both contexts

5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

What about /s/-final clusters in monomorphemic words?

ATB Deletion Group: Production (%) of word-final clusters in monomorphemic and short-stem inflected words:

MONOMORPHEMIC …VCC (e.g. *think, collect*)		SHORT-STEM INFLECTED …VC+C_{Agr} (e.g. *swims, talks*)	
Target-like	40	Target-like	3
C_2 deletion	40	Agr deletion	97
C_1 deletion	7	C_1 deletion	0
Epenthesis	13	Epenthesis	0

5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

ATB Deletion Group: Production (%) of word-final clusters in monomorphemic and short-stem inflected words:

MONOMORPHEMIC	SHORT-STEM INFLECTED
…VCC (e.g. *think, collect*)	…VC+C_{Agr} (e.g. *swims, talks*)
Target-like 40	Target-like 3

Interpretation:

- Coda clusters in monomorphemic words are in the process of being acquired (40% target-like);
- Clusters containing agreement morphology undergo deletion of inflection (only 3% target-like);
- Difficulties with coda clusters CANNOT underlie high rates of deletion of 3sg agreement morphology for the ATB deletion group.

5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

What about clusters in monomorphemic words?

Variable Deletion Group: Production (%) of word-final clusters in monomorphemic and short-stem inflected words:

MONOMORPHEMIC		SHORT-STEM INFLECTED	
…VCC (e.g. *think, collect*)		…VC+C_{Agr} (e.g. *swims, talks*)	
Target-like	64	Target-like	63
C_2 deletion	9	Agr deletion	37
C_1 deletion	13	C_1 deletion	0
Epenthesis	14	Epenthesis	0

5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

Variable Deletion Group: Production (%) of word-final clusters in monomorphemic and short-stem inflected words:

MONOMORPHEMIC	SHORT-STEM INFLECTED
…VCC (e.g. *think, collect*)	…VC+C_{Agr} (e.g. *swims, talks*)
Target-like 64	Target-like 63

Interpretation:

- Coda clusters in monomorphemic words are in the process of being acquired (64% target-like);
- Clusters containing agreement morphology show preservation of inflection (63% of the time);
- Difficulties with coda clusters CAN underlie moderate rates of deletion of 3sg agreement morphology for the variable deletion group.

5. Licensing L1 Segments in New Positions: /s/ as Coda and Agreement in L2 Mandarin-English

Summary and analysis for the two groups:

ATB Deletion Group:	**Variable Deletion Group:**
• Learners understand that English inflectional /s/ is not a regular coda; • They understand that English does not permit an analysis of inflectional /s/ inside the PWd of the base to which it attaches; • They are sensitive to the need for a unified analysis of inflection; • Their grammars do not permit the affixal clitic representation required for English inflection. • *Result:* ATB deletion of inflection.	• Learners treat English inflectional /s/ as a regular coda; • Because of the maximum of three segments in a word-final rhyme, inflectional /s/ surfaces only for forms where it can be organized inside the PWd of the base to which it attaches, like a regular coda; • It is otherwise deleted. • *Result:* Variable deletion of inflection, but variability is predictable from stem length.

6. Conclusions and Predictions: Licensing Old Segments in New Positions

Coda /s/ vs. coda /l/:

Observation:

- /s/ is earlier acquired than /l/ in coda by Mandarin–English speakers, even though the L1 permits sonorant codas (Study 1).

Conclusion: L2ers can be strategic:

- L2ers appear to be target-like in cases where substitution errors may go unnoticed by native speakers: coda /l/ (not coda /s/).

Predictions:

- *General:* Acquisition may be delayed if errors go unnoticed by native speakers, as there may be no motivation for learners to change the grammar to allow particular segments in new positions.
- *Specific:* Mandarin speakers should acquire coda /l/ in languages where it is light ([l]) (e.g. German, Spanish) earlier than in languages where it is dark ([ɫ]) (e.g. English, European Portuguese).

6. Conclusions and Predictions: Licensing Old Segments in New Positions

Coda /s/ vs. inflectional /s/:

Observations:

- Early acquisition of coda /s/ (Study 2) does not necessarily lead to early acquisition of inflectional /s/.
  - Suppliance rates for inflectional /s/ depend on learners' assumptions about how the morphology is prosodically represented.

L2ers can be strategic:

- L2ers who incorrectly treat English inflectional /s/ as a coda may appear to have acquired the appropriate structure but they are using the L1 structure for inflection (Mandarin).
- *Consequence:* Suppliance will be variable:
  - Mandarin–English (Study 2): Inflectional /s/ is realized after stems ending in short rhymes, not after stems ending in long rhymes.

6. Conclusions and Predictions: Licensing Old Segments in New Positions

Claim:

- Higher suppliance can't necessarily be interpreted as more target-like.
  - Mandarin–English L2ers who follow variable deletion pattern may have higher rates of suppliance but they are using the L1 structure.
  - L2ers who follow ATB deletion pattern *may* be more advanced: some may understand the evidence indicating that English inflectional /s/ is an affixal clitic, but they cannot build the appropriate structure in production, leading to ATB deletion.

Predictions:

- Should find comprehension–production asymmetries for inflectional /s/ for some learners (on comprehension and PTH, see Lieberman in prep).
- Should find U-shaped development for some learners (variable deletion > ATB deletion > target-like).

General Conclusion:

- Target-like segments and syllables aren't enough for target-like production of inflection!

谢谢!

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