

Formalizing the mismatch between L2 perception and production of European Portuguese liquids by L1-Mandarin learners

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Structure of the talk

- ▷ Introduction
 - Relationship between L2 perception and production
 - L2 perception and production of Portuguese liquids
- ▷ Previous account
- ▷ Present formal account: BiPhon-OT
- ▷ Conclusion

L2 perception and production

- ▷ Association (e.g. Flege 1995; Best & Tyler 2007)
- ▷ Dissociation
 - perception and production accuracy are not correlated
(e.g. Peperkamp & Bouchon 2011)
 - cross-modality training effects are not equally robust
(e.g. Wong 2013)

L2 perception and production of Portuguese liquids

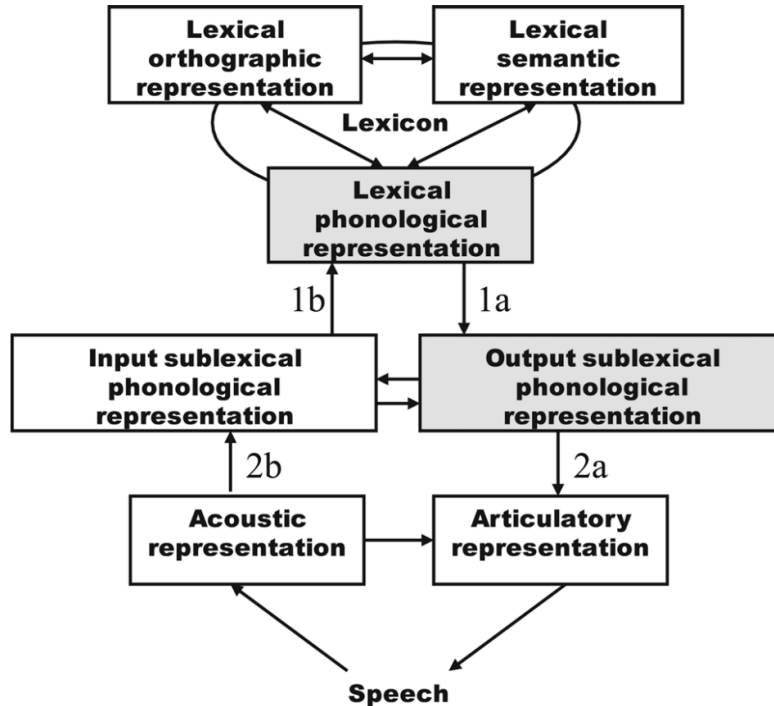
- ▷ L2 perception (Cao 2018; Vale 2020; Zhou in prep.)

Identification task : /r/ \rightleftharpoons /l/

- ▷ L2 production (Zhou 2017)

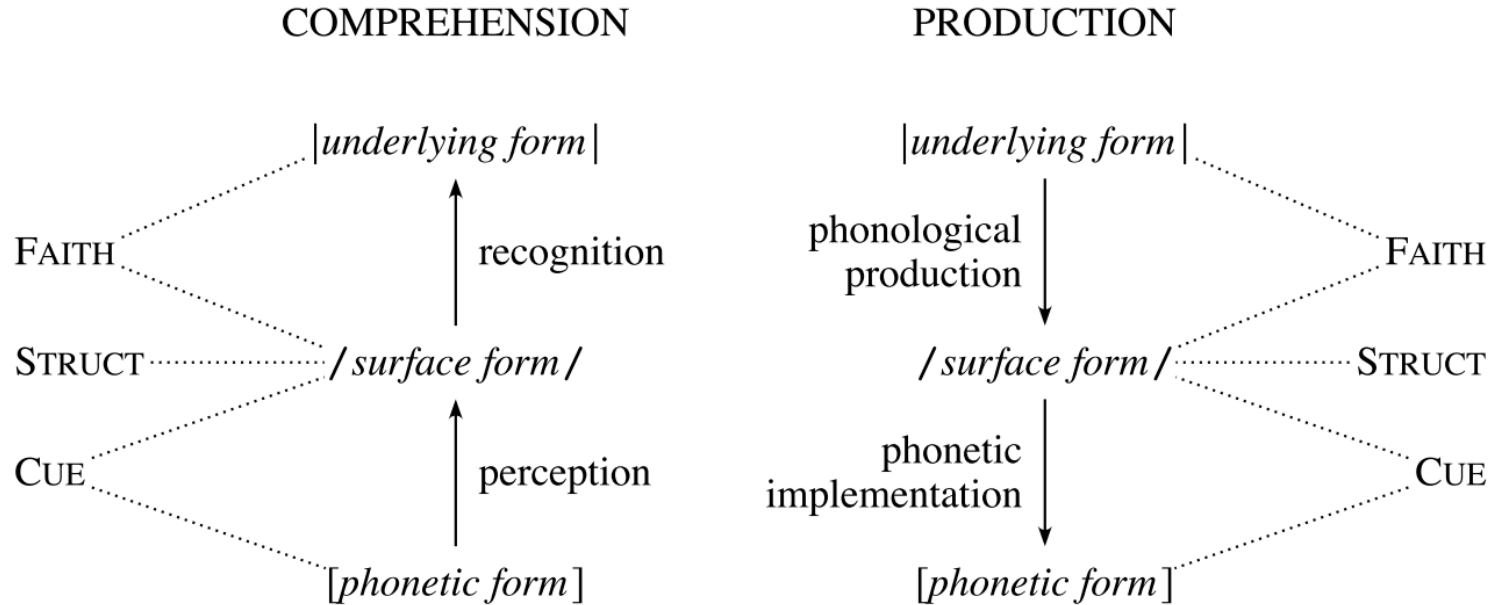
Picture-naming: /r/ \rightarrow [l] (* /l/ \rightarrow [r])

Distinct grammars account



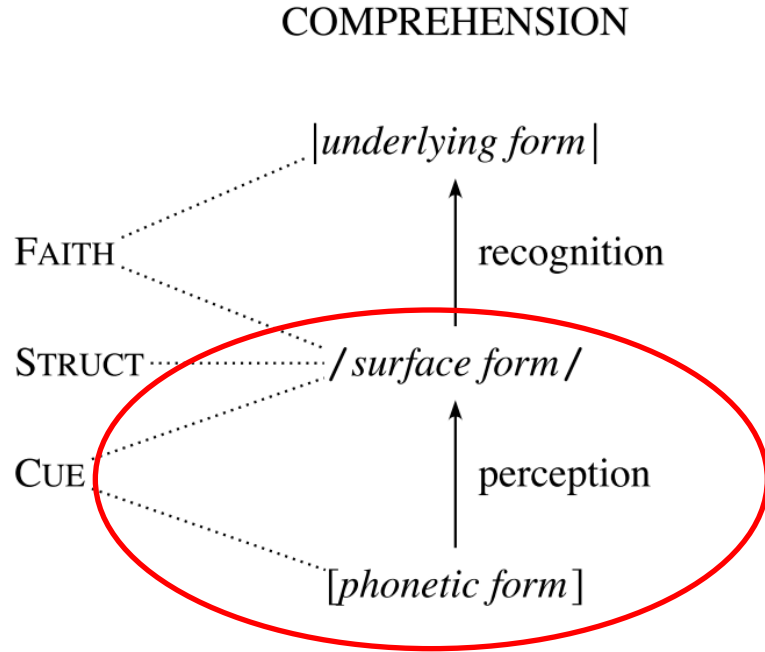
Models for speech perception and production
by Ramus et al. (2010: 313)

Present formal account



Bidirectional Phonology and Phonetics Model
(Boersma 2007; 2011; Boersma & Hamann 2009)

Modelling perception



- ▷ Cue constraints “[...] not /.../”

Portuguese [l] F3: 2692 Hz

[r] F3: 2542 Hz


*[2542] /l/ *[2542] /r/

*[2692] /l/ *[2692] /r/

- ▷ Structural constraints


Modelling L1 perception

(1)

[2692 Hz]	[2542Hz]	[2692Hz]	[2542Hz]	[2692Hz]
([l] _{Aud})	not /l/	not /r/	not /r/	not /l/
 /l/				*
/r/		*!		

(1): [l]_{Aud} is categorized as /l/ by native Portuguese perception grammar

(2)

[2542Hz]	[2542Hz]	[2692Hz]	[2542Hz]	[2692Hz]
([r] _{Aud})	not /l/	not /r/	not /r/	not /l/
/l/	*!			
 /r/			*	

(2): [r]_{Aud} is categorized as /r/ by native Portuguese perception grammar

Modelling L2 perception experimental results

(3)

[2542 Hz] ([r] _{Aud})	IDENT	*[2542Hz] /r/	*[2542Hz] /l/	*[2692Hz] /r/	*[2692Hz] /l/
☞ /l/			*		
☞ /r/		*			

(3) and (4): L1-Mandarin learners cannot perceptually distinguish [l]_{Aud} and [r]_{Aud}

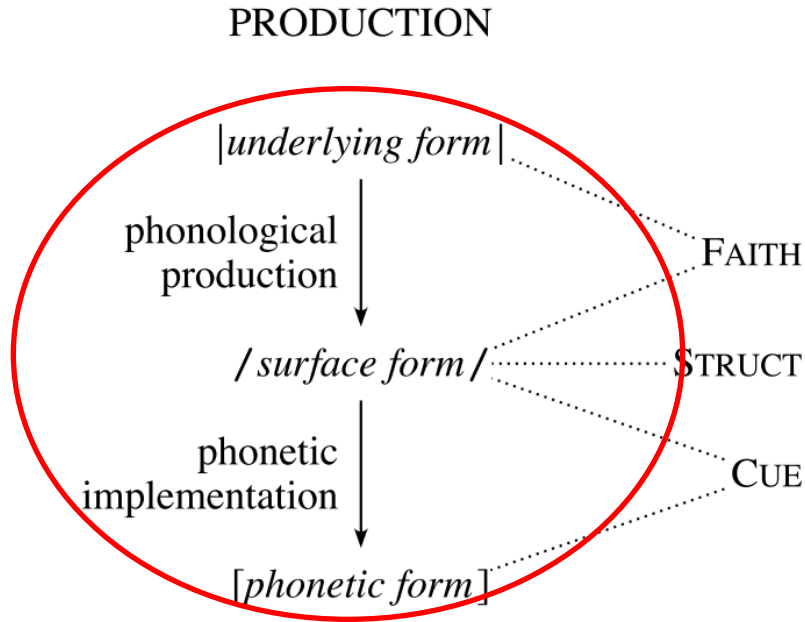
(4)

[2692Hz] ([l] _{Aud})	IDENT	*[2542Hz] /l/	*[2542Hz] /r/	*[2692Hz] /r/	*[2692Hz] /l/
☞ /l/					*
☞ /r/				*	

Bidirectional confusability

(Cao 2018; Vale 2020; Zhou in prep.)

Modelling production



- ▷ Faithfulness constraints

IDENT

- ▷ Cue constraints “/.../ not [...]”

**/l/* [2542] **/r/* [2542]

**/l/* [2692] **/r/* [2692]

- ▷ Structural constraints

Modelling production

- ▶ The production results, reminiscent of asymmetrical lexical access reported previously in the literature (e.g. Darcy et al. 2013), suggest that the /l/-/ɾ/ distinction is somehow preserved, yet not target-like in the L2 lexicon (otherwise, the confusion would be bidirectional).
- ▶ Lateral |l| Tap |@|

Modelling L2 production results

(5)

mala	IDENT	* /l/	* /r/	* /r/	* /l/
		[2542Hz]	[2542Hz]	[2692Hz]	[2692Hz]
☞ /.ma.le./ [2692Hz] ([l] _{Aud})					*
/.ma.le./ [2542Hz] ([r] _{Aud})		*!			
/.ma.re./ [2542Hz] ([r] _{Aud})	*!		*		
/.ma.re./ [2692Hz] ([l] _{Aud})	*!			*	

(5): |l| is realised by L2 production grammar as [l]_{Aud}

(6)

ka@a	IDENT	* /l/	* /r/	* /r/	* /l/
		[2542Hz]	[2542Hz]	[2692Hz]	[2692Hz]
☞ /.ka.le./ [2692Hz] ([l] _{Aud})					*
/.ka.re./ [2542Hz] ([r] _{Aud})			*!		
☞ /.ka.re./ [2692Hz] ([l] _{Aud})				*	
/.ka.le./ [2542Hz] ([r] _{Aud})		*!			

(6): |@| (underspecified tap) is realised by L2 production grammar as [l]_{Aud}

Unidirectional confusability (Zhou, 2017)

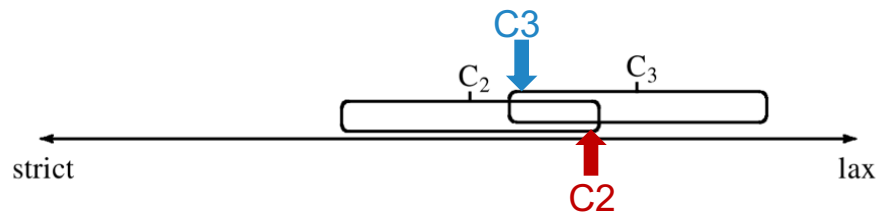
Modelling more target-like L2 perception

(3)

[2542 Hz] ([r] _{Aud})	IDENT	*[2542Hz] /r/	*[2542Hz] /l/	*[2692Hz] /r/	*[2692Hz] /l/
☞ /l/			*		
☞ /r/		*			

(4)

[2692Hz] ([l] _{Aud})	IDENT	*[2542Hz] /l/	*[2542Hz] /r/	*[2692Hz] /r/	*[2692Hz] /l/
☞ /l/					*
☞ /r/				*	



Boersma & Hayes (2001), p. 48

Modelling more target-like L2 perception

(7)

[2692Hz] ([l]Aud)	IDENT	*[2542Hz] /l/	*[2692Hz] /r/	*[2542Hz] /r/	*[2692Hz] /l/
☞ /l/					*
/r/			*!		

(8)

[2542Hz] ([r]Aud)	IDENT	*[2542Hz] /l/	*[2692Hz] /r/	*[2542Hz] /r/	*[2692Hz] /l/
/l/		*!			
☞ /r/				*	

(7) and (8): This state of cue constraint ranking allows L2 learners to perceive the lateral and the tap as separated categories.

Modelling more target-like L2 production

(9)

mala	IDENT	* /l/ [2542Hz]	* /r/ [2692Hz]	* /r/ [2542Hz]	* /l/ [2692Hz]
☞ /.ma.le./ [2692Hz] ([l] _{Aud})					*
/.ma.le./ [2542Hz] ([r] _{Aud})		*!			
/.ma.re./ [2542Hz] ([r] _{Aud})	*!			*	
/.ma.re./ [2692Hz] ([l] _{Aud})	*!		*		

(9) and (10):

confusability in more advanced L2 production is still unidirectional.

(10)

ka@a	IDENT	* /l/ [2542Hz]	* /r/ [2692Hz]	* /r/ [2542Hz]	* /l/ [2692Hz]
☞ /.ka.le./ [2692Hz] ([l] _{Aud})					*
☞ /.ka.re./ [2542Hz] ([r] _{Aud})				*	
/.ka.re./ [2692Hz] ([l] _{Aud})			*!		
/.ka.le./ [2542Hz] ([r] _{Aud})		*!			

Conclusion

- ▷ The mismatch between L2 perceptual and production results is not due to two separate phonological grammars (constraint rankings), but to the fact that the two paralinguistic processes targeted by perception and production studies involve different mappings.
- ▷ Perception experiment: auditory to phonological surface form
- ▷ Production experiment: lexical form onto phonological surface and phonetic form (**and thus the bidirectional use of cue constraints and the L2 lexicon influences decision making**)

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