

Early consonant/vowel asymmetry: evidence from speech segmentation in French-learning 8-month-olds

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Specificity of the sound pattern of words

- Do infants have the same phonetic sensitivity?
 - to the consonantal contrasts
 - to the vocalic contrasts
- Is there a consonantal bias?
- Nespor et al. (2003): division of labor (C/V hypothesis)
 - Consonant (C): lexical level (C-bias)
 - Vowel (V): prosodic and syntactic levels (V-bias)
 - These biases are proposed to facilitate language acquisition
 - Typological observations (tongue twisters...)

What is the origin of this C-bias?

- Hypothesis 1: pre-lexical level (Toro et al., 2008)

The C-bias:

- would be phonologically driven
- would emerge before a sizeable lexicon
- could be present very early (from birth?)

What is the origin of this C-bias?

- Hypothesis 1: pre-lexical level (Toro et al., 2008)

The C-bias:

- would be phonologically driven
- would emerge before a sizeable lexicon
- could be present very early (from birth?)

- Hypothesis 2: lexical level (Keidel et al., 2007)

The C-bias:

- would be due to the structure of the lexicon
- hence linked to the acquisition of a sizeable lexicon
- not present before/around 12 months

Specificity of the sound pattern of words – infants

- French-learning infants

(Havy & Nazzi, 2009 ; Nazzi, 2005 ;Nazzi & Bertoncini, 2009 ; Zesiger & Jöhr, 2011)

- Sensitivity to MP task: C-bias around 14/16 months
- Word learning task: C-bias at 20 and 14 months

→ In French, C-bias is clearly present during the second year of life whatever the task is

Specificity of the sound pattern of words – infants

- English-learning infants

(Curtin et al., 2009 ; Mani & Plunkett, 2007 ; Yoshida et al., 2009 ; Stager & Werker, 1997 ; Nazzi et al., 2009 ; Floccia et al., in prep.)

- Sensitivity to MP task: possible C-bias at 15 months, though not at 12, 18 and 24 months
- Word learning task: C-bias at 30 months but not at 16 or 24 months

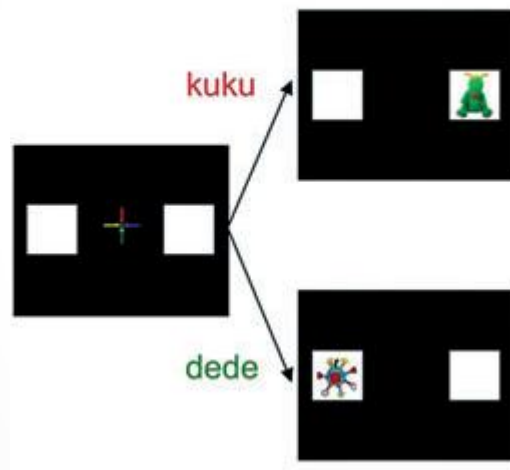
→ Evidence of C-bias in English depends on the age and on the type of task

C-bias during the 1st year?

Hochmann et al., 2011

- Do infants rely more on C or on V to identify words?
- 26 Italian-learning 12-month-olds

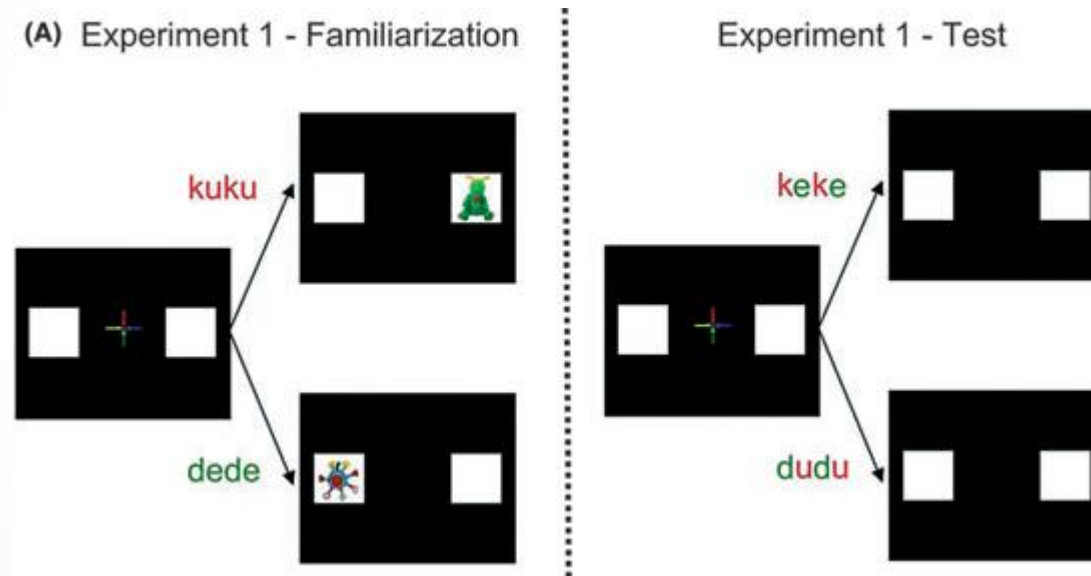
(A) Experiment 1 - Familiarization



C-bias during the 1st year?

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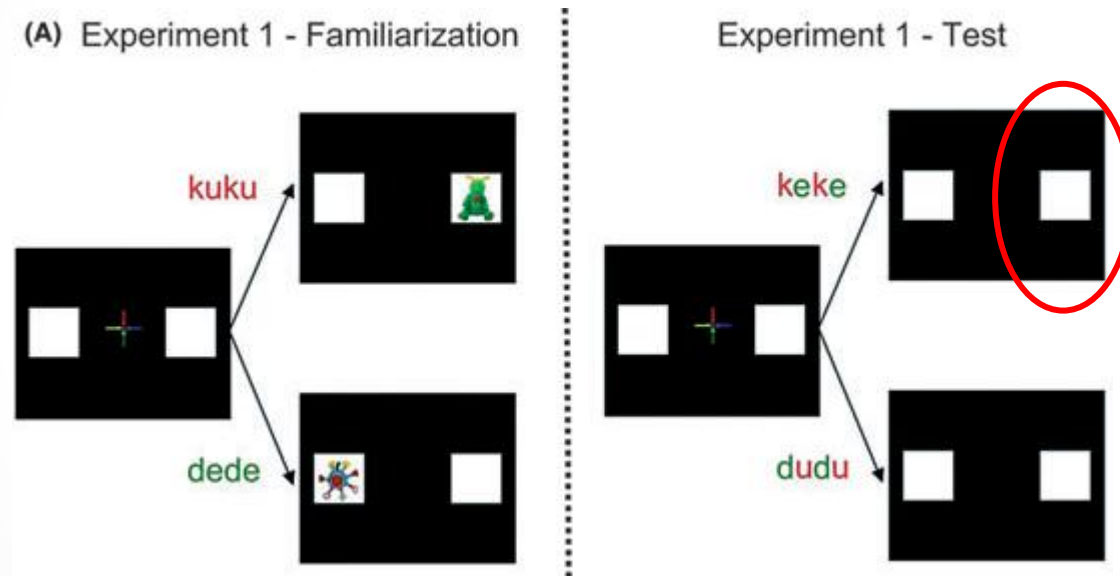


- Which side will they prefer to look at?

C-bias during the 1st year?

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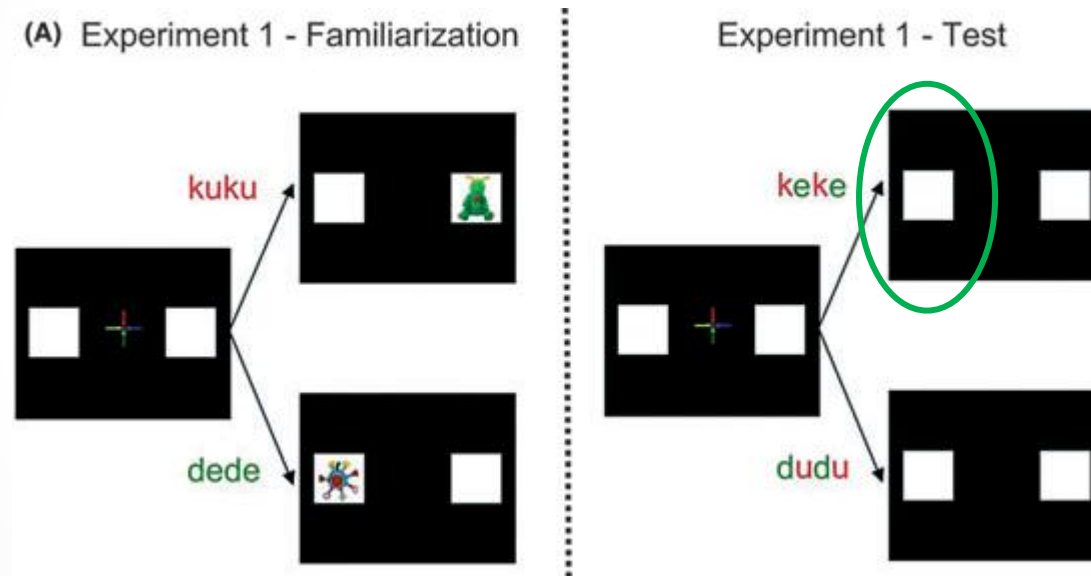


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C-bias during the 1st year?

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- Which side will they prefer to look at?

C-bias during the 1st year?

Hochmann et al., 2011

- At 12 months, infants looked more at the side predicted by consonants
 - They consider 2 words sharing consonants more similar than 2 words sharing vowels.
- At 6 months, the bias seems reversed → V-bias

C-bias apparently appears during the 1st year of life in Italian, at least for these specific stimuli

→ What about in other languages (French)? In other tasks?

Specificity of the sound pattern of words – infants

- C-bias appears to emerge with development
- C-bias seems to be language-dependant

→ To explore the C-bias in younger infants, we studied the specificity of segmented word forms

Segmentation studies

- French natives:
 - 7.5/8 months: monosyllabic (Goyet et al. in prep ; Gout, 2001) and bisyllabic words (Polka & Sundara, 2011; Nazzi et al., submitted)
- English natives :
 - 7.5/8 months: monosyllabic (Jusczyk & Aslin, 1995) and trochaic bisyllabic (Jusczyk et al., 1999) words
 - 10.5 months: iambic bisyllabic words (Jusczyk et al., 1999)

Segmentation in HPP (Headturn Preference Procedure)

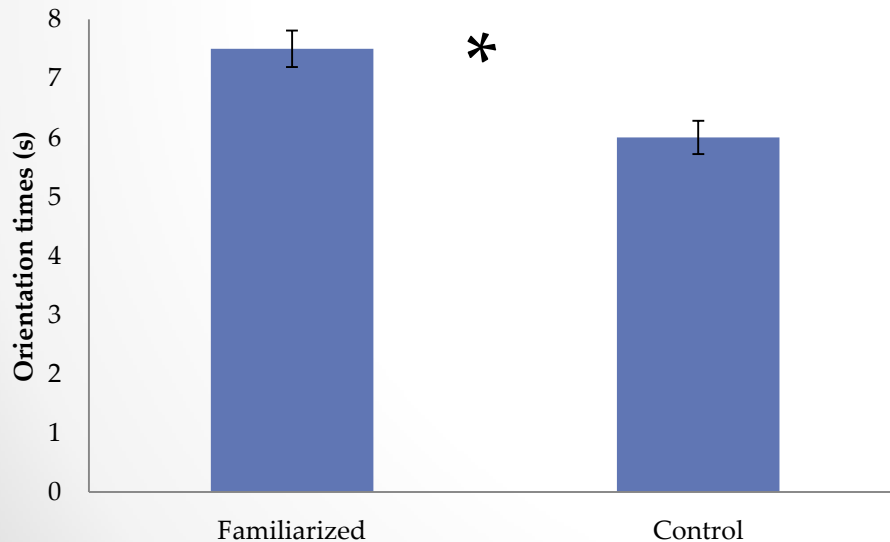
20 French-learning 8-month-olds

	Familiarization	Test	
	Passages	Target	Control
Target word 1	Ce DIT énoncé est bien formulé. J'aime quand il narre plusieurs DITS imagés. Les DITS annonceurs du mage sont à craindre. Elles ne relatent que quatre DITS mensongers. Leurs DITS ne doivent pas être entendus. J'ai appris quelques DITS sur lui. Quatre DITS sont prononcés par la femme. L'homme vocifère de nombreux DITS contre lui.	DIT	THE
Target word 2	Trois POTS bleus sont bien suffisants. Je mets quelques pivoinis dans ce POT vert. Quelques POTS en grès sont en vente. J'aimerais trouver quatre POTS dans le jardin. Mes POTS rouges en terre sont cassés. Il recycle ses POTS contenant certains cornichons. Vos POTS de yaourt se recyclent. Au marché cinq POTS d'olives sont offerts.	POT	GOÛT

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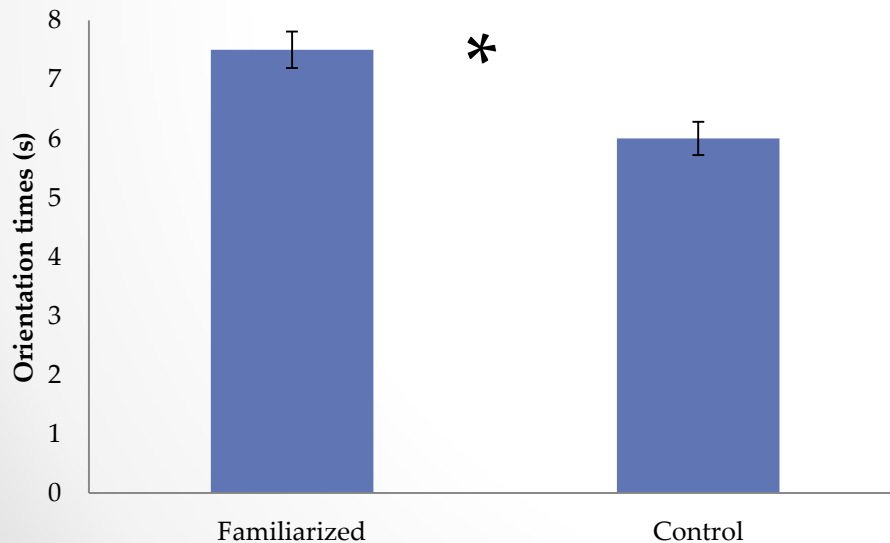


Results from Goyet et al., in prep.

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Results from Goyet et al., in prep.

French-learning 8-month-olds can segment the speech stream
→ Recognition of a monosyllabic CV word heard in familiarization

Looking at specificity: Design 1

MP vs. Target

- Do French-learning 8-month-olds have phonetically specific segmented word forms?
- Do French-learning 8-month-olds present a C-bias during recognition of segmented word forms?

	Familiarization	Test	
	Passages	Mispronounced target	Target
Target Word 1 Exp 1	___CV___	CV'	CV
Target Word 2 Exp 2	___CV___	C'V	CV

All the CV words are actual words

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If infants detect the phonetic change, then the MP will be considered as different from the target word, and thus infants will listen more to the target than to the MP.

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If not, the MP will be assimilated to the target word and thus infants will listen equally to the MP and to the target (given the segmentation study data)

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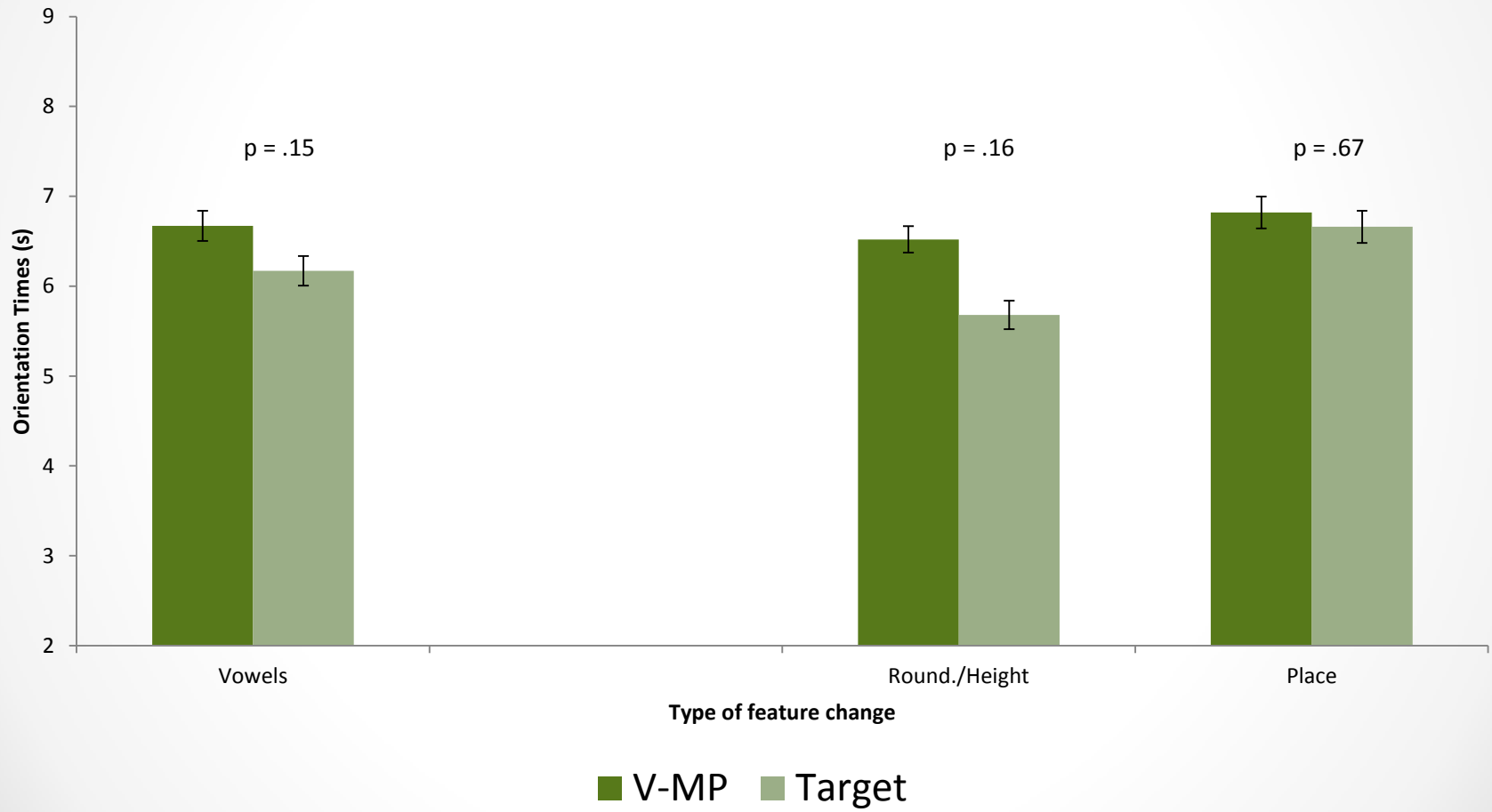
	Familiarization	Test	
	Passages	Mispronounced target	Target
Target Word 1 Exp 1	___ CV ___	CV'	= CV
Target Word 2 Exp 2	___ CV ___	C'V	< CV

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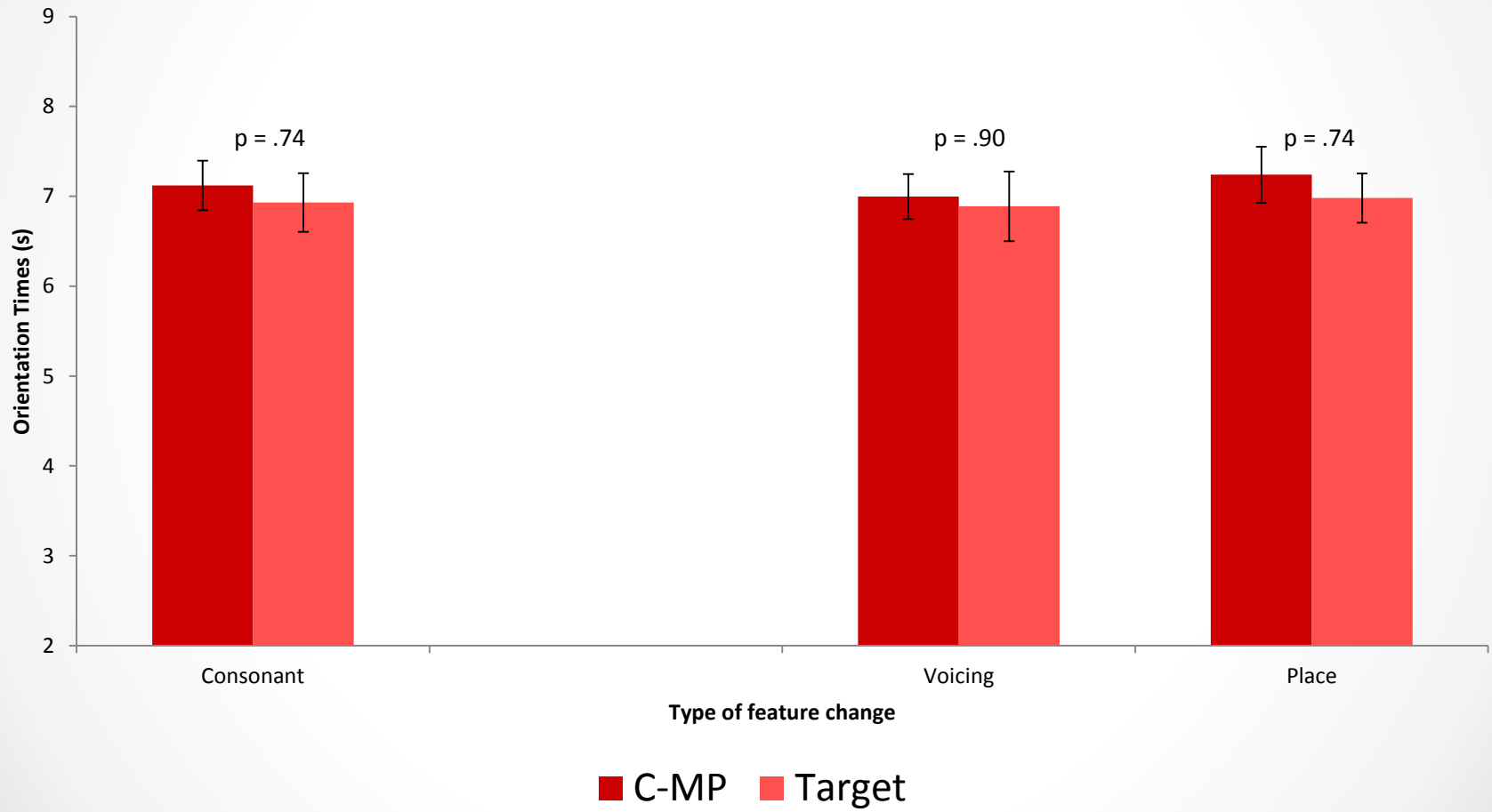
Exp 1: V-MP vs. Target

20 French-learning 8-month-olds



Exp 2 : C-MP vs. Target

20 French-learning 8-month-olds



Experiments 1 & 2

Discussion

V-MP = Target

C-MP = Target



No phonetic specificity?
No C-bias?

- Apparently infants could not detect the mispronunciations, even in the consonant condition
- Too difficult? MP and Target were too alike?
- Seeing these results, we decided to run two other experiments.

Looking for specificity: Design 2 MP vs. Control

- We did not obtain a C-bias in Experiments 1 & 2.

	Familiarization	Test	
	Passages	Mispronounced target	Control
Target Word 1 Exp 3	___CV___	CV'	XX
Target Word 2 Exp 4	___CV___	C'V	YY

Looking for specificity: Design 2 MP vs. Control

	Familiarization	Test	
	Passages	Mispronounced target	Control
Target Word 1 Exp 3	___CV___	CV'	XX
Target Word 2 Exp 4	___CV___	C'V	YY

If infants detect the phonetic change, then the MP will be considered as different from the target word, and thus infants will listen equally to MP and control.

Looking for specificity: Design 2 MP vs. Control

	Familiarization	Test	
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Target Word 2 Exp 4	___ CV ___	C'V	YY

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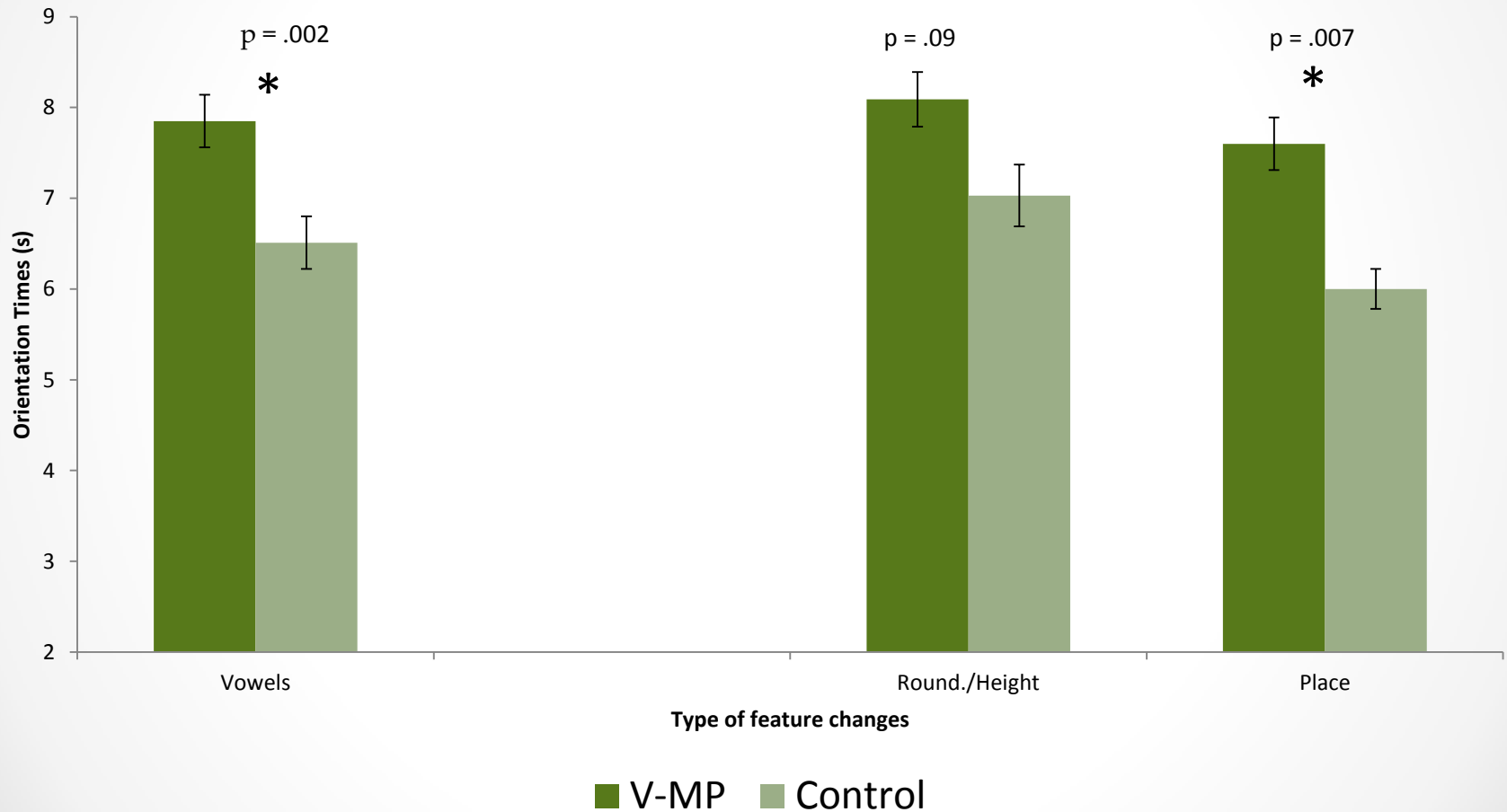
	Familiarization	Test	
	Passages	Mispronounced target	Control
Target Word 1 Exp 3	___ CV ___	CV'	> XX
Target Word 2 Exp 4	___ CV ___	C'V	= YY

If infants detect the phonetic change, then the MP will be considered as different from the target word, and thus infants will listen equally to MP and control.

If not, the MP will be assimilated to the target word and thus infants will listen more to the MP than to the control (given the segmentation study data)

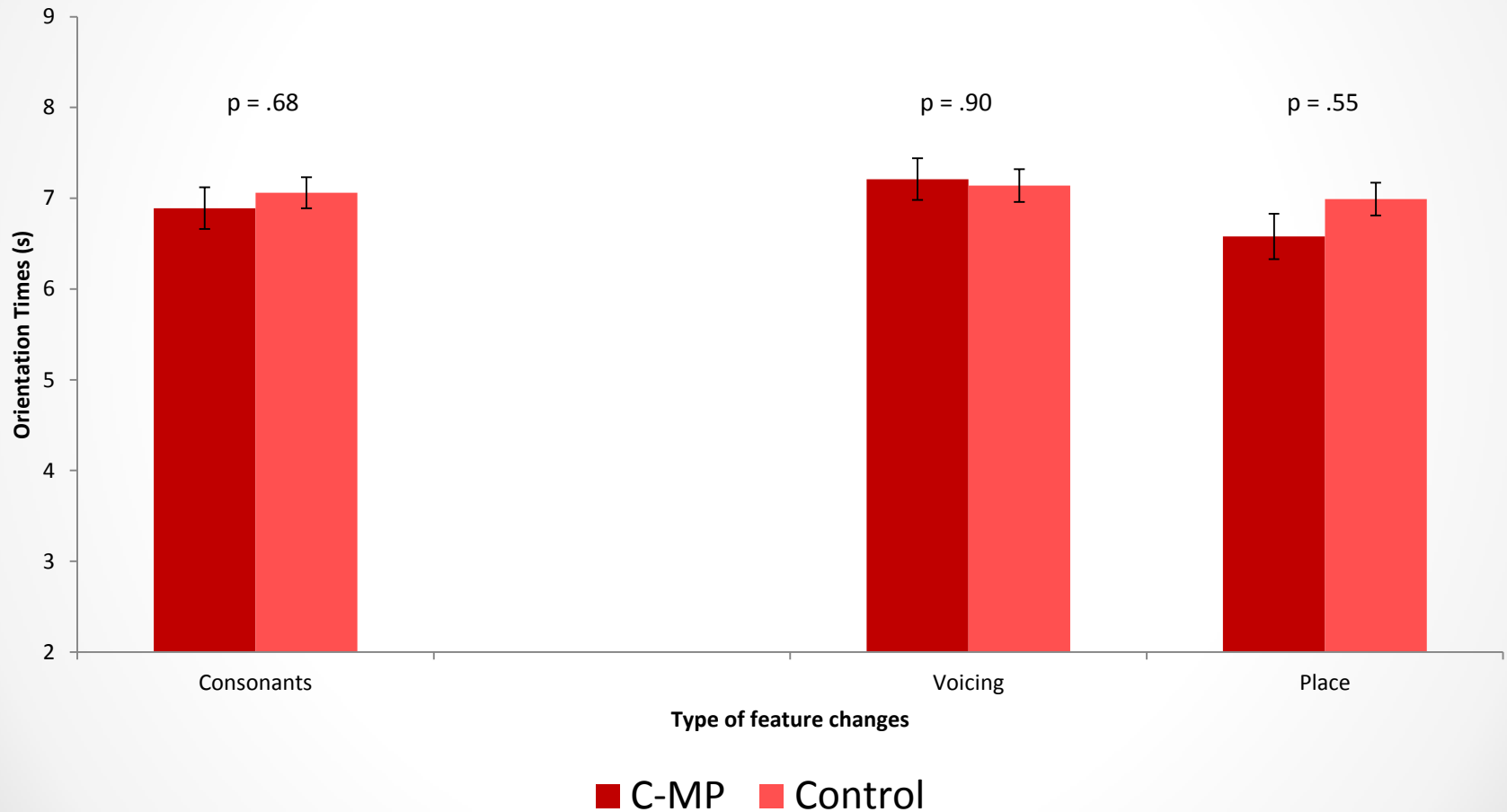
Exp 3: V-MP vs. Control

20 French-learning 8-month-olds



Exp 4: C-MP vs. Control

20 French-learning 8-month-olds



Experiments 3 & 4

Discussion

- We obtained a C-bias with a segmentation effect in V condition (suggesting no V specificity) and a null effect in C condition (suggesting C specificity).

V-MP > Control

C-MP = Control

- The C-bias seems to be present at 8 months of age

General Discussion

- French-learning 8-month-olds
 - No bias with MP vs. Target and no evidence of infants detecting the MPs
 - C bias with MP vs. Control words
- In Experiments 1 & 2, during the test phase MPs have 50% similarity with Target words

/te/ - /ti/ or /ka/ - /ta/

- Whereas in Experiments 3 & 4, during the test phase MPs have 0% similarity with Control words

/te/ - /pu/ or /gi/ - /ju/

→ It might have been easier to distinguish two words that were completely different.

General Discussion

- Experiments 3 & 4 results are in favor of the CV hypothesis and further demonstrate that the C bias is established before learning a sizeable lexicon.
- Thus the C bias would be phonologically driven and its origins would come from the sound patterns of words.

Next steps (1)

- Conflict task

	Familiarization	Test	
	Passages	C-MP	V-MP
Exp 5	___CV___	C' V	CV' '

Next steps (1)

- Conflict task

	Familiarization	Test	
	Passages	C-MP	V-MP
Exp 5	___CV___	C'V	< CV'

We predict that infants will rely more on the C than on the V to recognize a word.

Thus they will listen longer to the word keeping the original C

Next steps (2)

- 6-month-olds are able to segment the speech
→ Experiments 1 to 4 with 6-month-olds
- Since Hochmann found a reversed pattern in 6-month-olds (V-bias), it will be interesting to test 6-month-olds with the segmentation paradigm and observe whether these infants show a reversal of the C bias in recognizing segmented word forms

Thank you for your attention

Appendices

Experiment 1				
Condition	Feat. changes	Familiarization	Test	
		Passages	MP	Target
G1-V1	Round./ Height	/ti/ - /fã/	/te/ - /fõ/	/ti/ - /fã/
G1-V2		/te/ - /fõ/	/ti/ - /fã/	/te/ - /fõ/
G1-V3	Place	/py/ - /gø/	/pu/ - /go/	/py/ - /gø/
G1-V4		/pu/ - /go/	/py/ - /gø/	/pu/ - /go/

Appendices

Experiment 2				
Condition	Feat. changes	Familiarization	Test	
		Passages	MP	Target
G1-C1	Voicing	/py/ - /ʒu/	/by/ - /ju/	/py/ - /ʒu/
G1-C2		/by/ - /ju/	/py/ - /ʒu/	/by/ - /ju/
G1-C3	Place	/ta/ - /di/	/ka/ - /gi/	/ta/ - /di/
G1-C4		/ka/ - /gi/	/ta/ - /di/	/ka/ - /gi/

Appendices

Experiment 3				
Condition	Feat. changes	Familiarization	Test	
		Passages	MP	Control
G2-V1	Round./ Height	/ti/ - /fã/	/te/ - /fõ/	/pu/ - /go/
G2-V2		/te/ - /fõ/	/ti/ - /fã/	/py/ - /gø/
G2-V3	Place	/py/ - /gø/	/pu/ - /go/	/ti/ - /fã/
G2-V4		/pu/ - /go/	/py/ - /gø/	/te/ - /fõ/

Appendices

Experiment 4				
Condition	Feat. changes	Familiarization	Test	
		Passages	MP	Control
G2-C1	Voicing	/py/ - /ʒu/	/by/ - /ju/	/ka/ - /gi/
G2-C2		/by/ - /ju/	/py/ - /ʒu/	/ta/ - /di/
G2-C3	Place	/ta/ - /di/	/ka/ - /gi/	/by/ - /ju/
G2-C4		/ka/ - /gi/	/ta/ - /di/	/py/ - /ʒu/