Workshop on Prosody and Meaning
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Early perception of the prosody of statements and questions

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Introduction: Questions and prosody across languages

- Languages differ in how the distinction between statements and yes-no questions is conveyed

e.g., English, Catalan (Ladd, 2008; Prieto & Rigau, 2007)

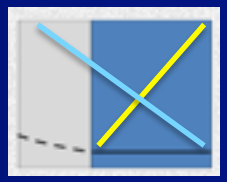
e.g., Vata, Shekgalagari (Hyman & Monaka, 2011; Rialland, 2007)

e.g., Italian, **Portuguese** (Maiden & Robustelli, 2000; Mateus et al., 2003)

Introduction: Questions and prosody across languages

- Use of prosody (intonation) only, ≈second most frequent means to mark the distinction (Dryer, 2011)
- Although the functions of prosody are quite general across languages, prosodic cues are language-specific

Final pitch (boundary tones)



Rising pitch (EP)
Falling pitch (Basque)
Low pitch (Chickasaw)

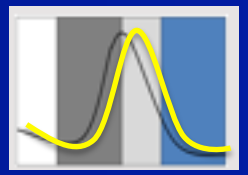
Lexical tone, e.g. Mandarin

Peak height

e.g., Balearic Catalan, Japanese (height of the rise)

Focus, e.g. English

Peak alignment

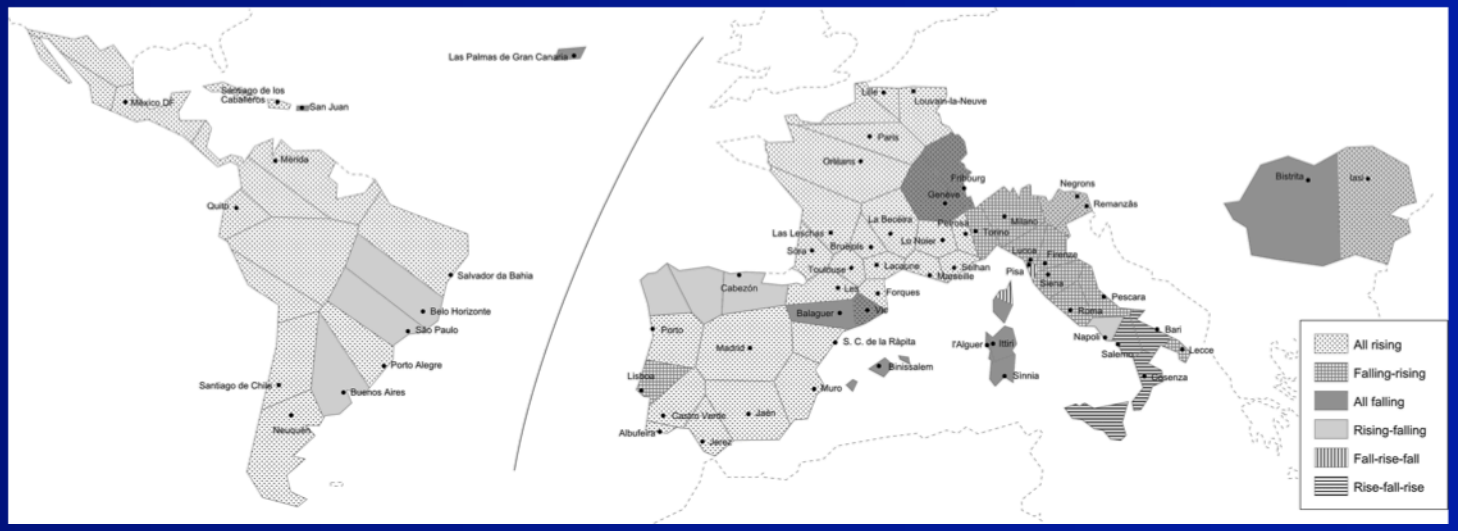


e.g., Neapolitan Italian

Focus, e.g. Portuguese

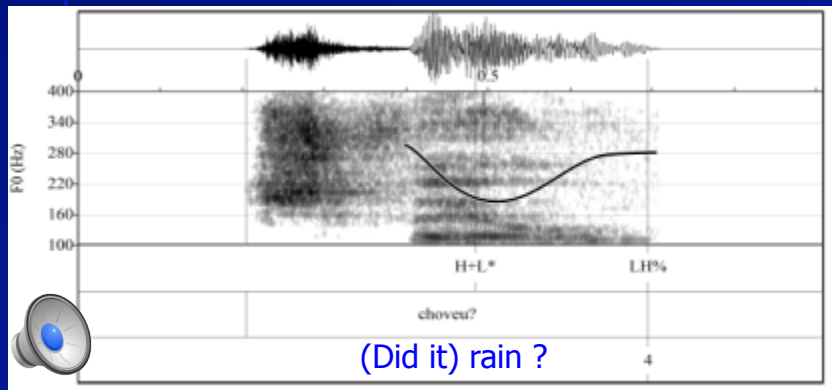
Introduction: Questions and prosody across languages

- Romance languages: An illustration of intonational variation in signaling yes-no questions (Frota & Prieto, 2015)



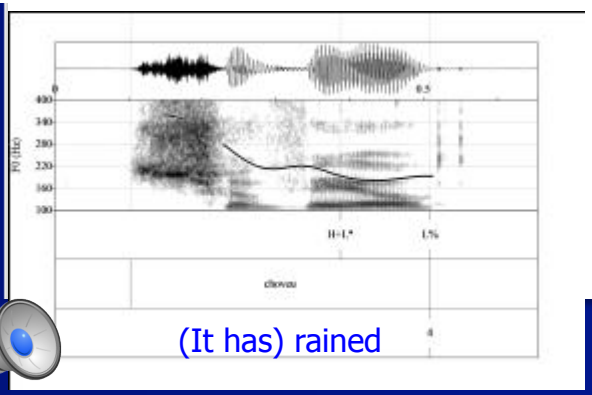
Introduction: Questions and prosody across languages

- European Portuguese: Prosody only

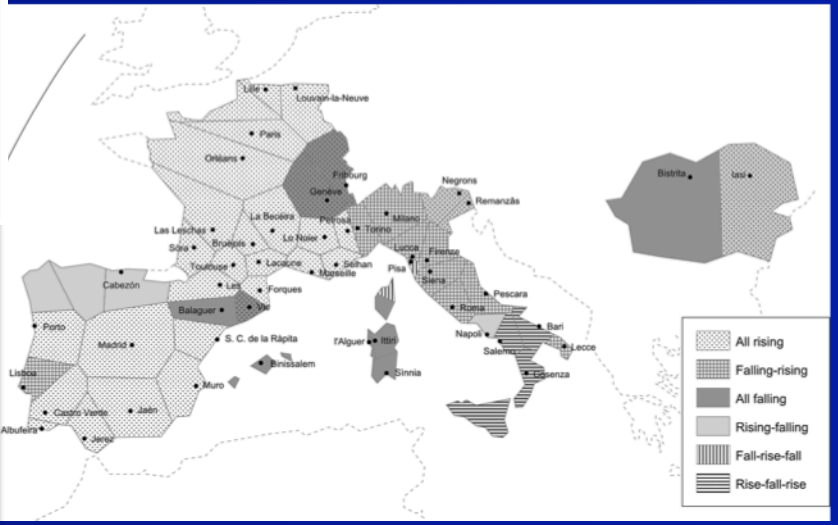


(Did it) rain ?

Choveu? H+L* LH% / Choveu. H+L* L%

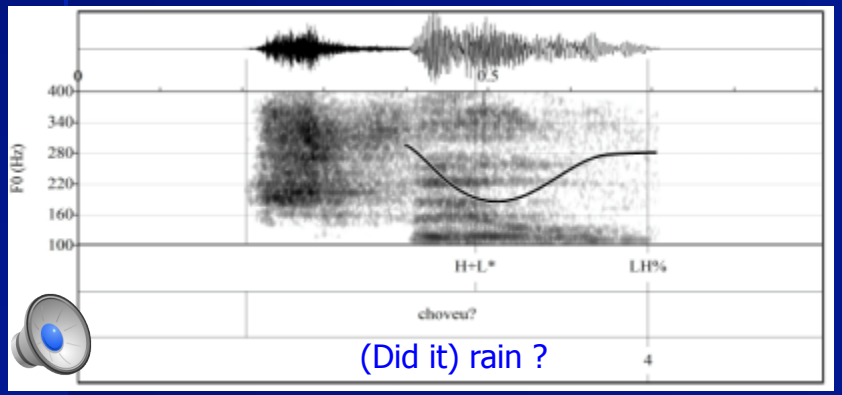


(It has) rained

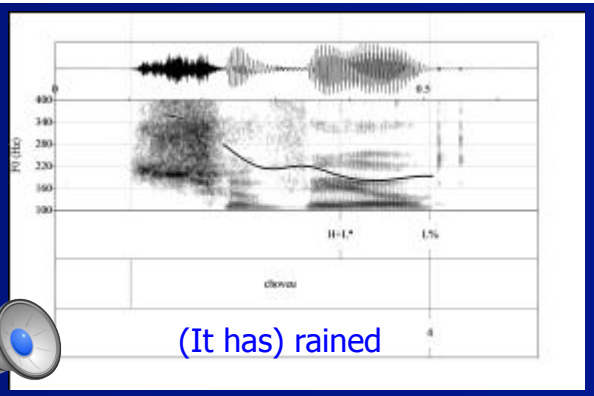


Introduction: Questions and prosody across languages

- European Portuguese (EP): Prosody only



(Did it) rain ?

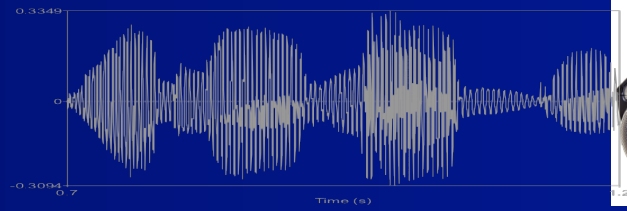


(It has) rained

Choveu? H+L* LH% / Choveu. H+L* L%

MEANING

Introduction: Early perception of prosody



My language?

- The ability to identify forms of phonetic variation in speech that are *relevant to meaning* is essential to language development.
- Learning a language involves a stronger commitment to the native language as development proceeds, modulated by perceptual assimilation and phonetic salience (e.g., Kuhl 2004, Safran et al. 2006, Best & Roberts 2003, Narayan et al. 2010)

Introduction: Early perception of prosody

Prosody	No variability	Segmental variability
Stress	✔	✖ only after 6 mos & native
Tone	✔	✖? only after 6 months, native
Pitch accent		✔ as early as 4 mos, for Japanese learners
Tune	✔	✔ as early as 5 mos, Portuguese learners (native)

Some pitch contrasts perceived very early on, if native

Skoruppa et al. 2013; Mattock & Burnham, 2006; Mattock et al., 2008; Yeung et al., 2013; Liu & Kager, 2014; Brouwer & Fikkert, 2017; Shi 2010; Sato et al. 2009; Frota et al. 2014

Introduction: Early perception of prosody

STATEMENT: H+L* L%

QUESTION: H+L* LH%

- Basic/frequent sentence types: Ability to distinguish between them is crucial (Frazier, Gelman, & Wellman, 2009; Koegel et al, 2010; Tyack & Ingram, 1977)
  - Process the input the child is exposed to
  - Communication and social interaction
- Prosodic discrimination ability
  - Prerequisite for the acquisition of statement/yes-no question categories

Little is known about infants' perception of intonation

Introduction

- Research questions
  - Does early perception of intonation support precocious discrimination abilities for pitch contrasts (as in the case of pitch accent)?
  - To what extent is early sensitivity to pitch contrasts independent from/dependent on the native language?
  - Does the nature of the pitch cues matter?

Phonetic salience

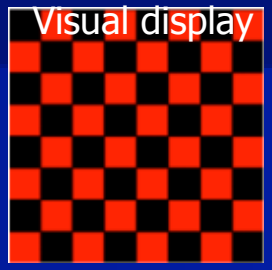
Native listeners

- **Implications** for the acquisition of linguistic categories cued by prosody

Overview

1. Early dicrimination studies
   - Study 1: native Statement vs. Yes-no question (EP)
   - Study 2: English-learning and Basque-learning infants' perception of the EP sentence type distinction
   - Study 3: EP-infants' perception of a lexical tone sequence contrast (Mandarin) and a lexical pitch accent contrast (Japanese)
2. Novel word learning and intonation – study 4
3. Other linguistic contrasts cued by prosody
   - Study 5: Broad vs. Narrow focus (EP: peak alignment)
4. General discussion

1. Early discrimination: Method



- Procedure
- Modified version of the visual habituation paradigm (Stager & Werker, 1997)

Habituation
malo, lemo,
mela, nirra…

→ < 60%, 4 sliding window

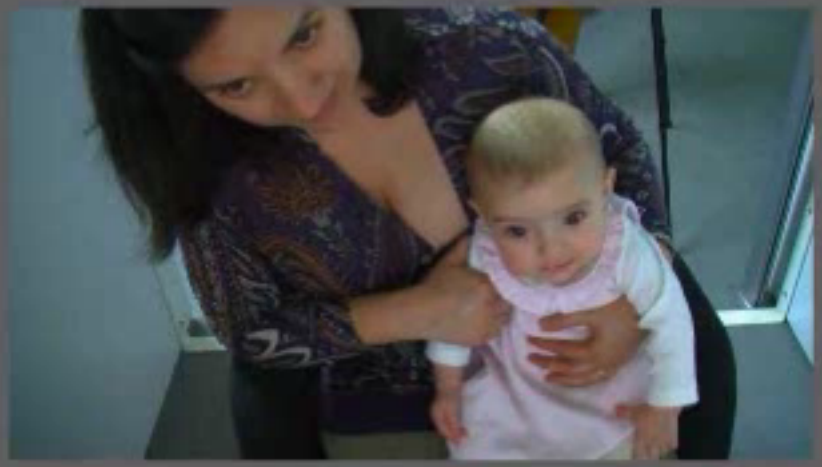
Test
luma, milo,
rina, lamo…

Same

Different

- Looking times to visual display were recorded and compared
- If sensitive to the prosodic contrast, infants should display longer listening times to the novel (different) trials

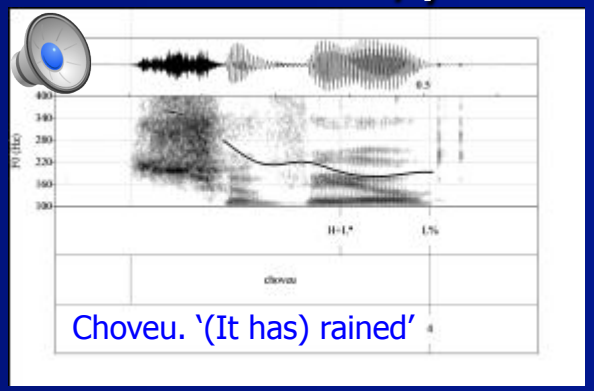
Lisbon Babylab Visual Habituation Paradigm



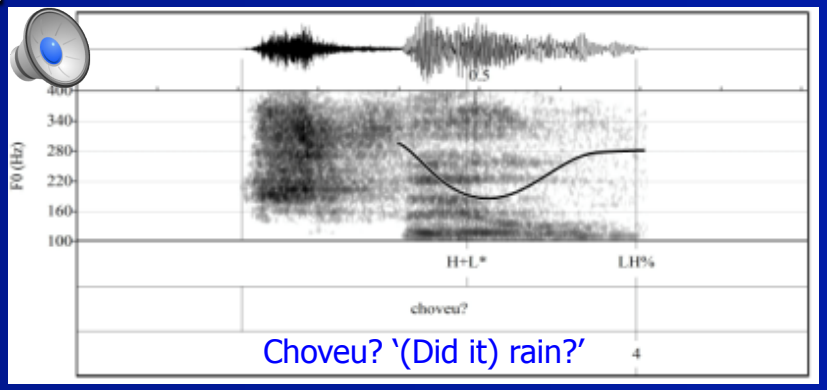
1. Early discrimination: Study 1

Frota, Butler & Vigário (2014) Infancy, 19(2), 194-213

- The statement/yes-no question distinction



Choveu. '(It has) rained'

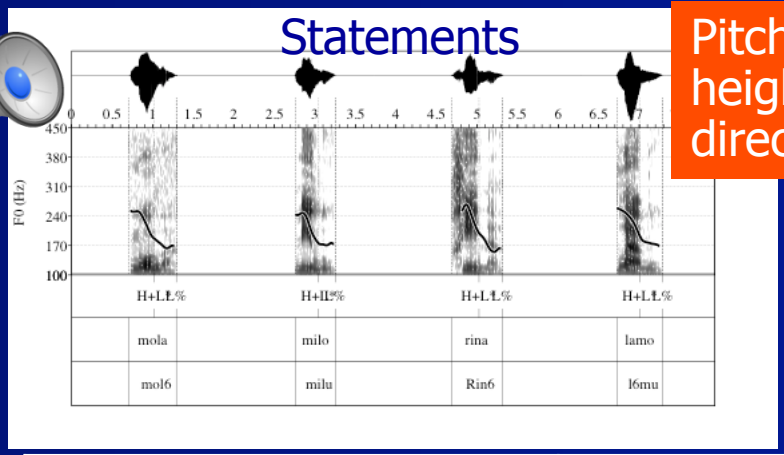


Choveu? '(Did it) rain?'

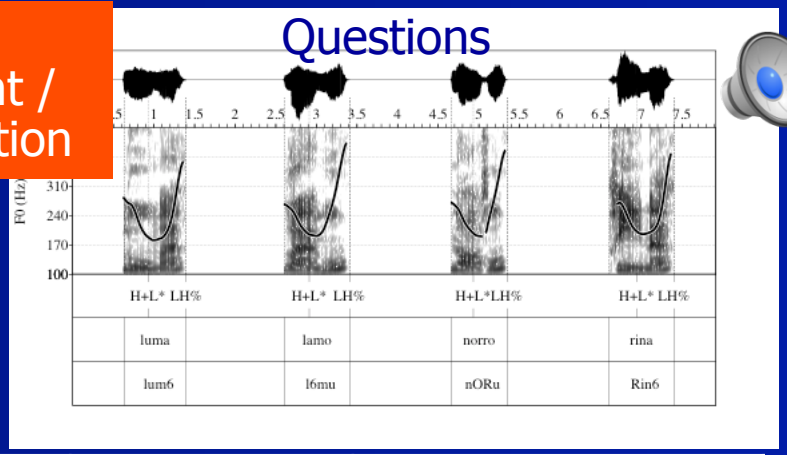
  - Yes-no questions are string identifical to statements (Mateus et al. 2003)
  - Main cue final pitch: statement: H+L***L%**; question: H+L***LH%**
  - Longer durations of nuclear and post-nuclear syllables in questions
  - Higher first peak in questions is optional (Frota 2002)
  - The prosodic contrast is perceived by adult native speakers (Falé & Faria 2005)

1. Early discrimination: Study 1 statement/yes-no question

- Materials: Segmentally varied, single pseudo-word utterances produced by a female native speaker in infant-directed speech



Pitch height / direction



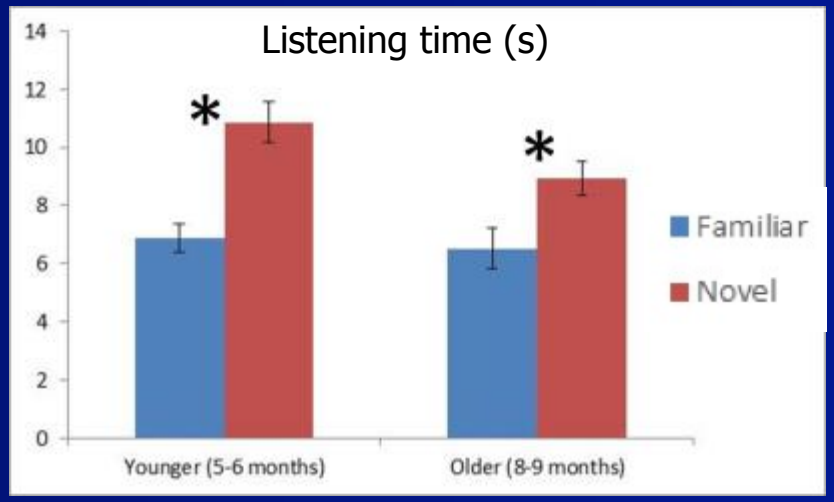
Acoustic analysis	Statements	Questions	t-test
F0 Peak height 1st syll (Hz)	255	255	.16, p = .91
F0 range 1st syll (Hz)	67	66	0.12, p = .9
F0 range 2nd syll (Hz)	-25	192	23.46, p<.001
Final F0 (Hz)	163	380	23.61, p<.001
Duration (ms)	529	765	11.91, p<.001

1. Study 1: Native discrimination of statement/yes-no question

- Participants
  - 40 infants (from monolingual homes in the Lisbon area) split into two age groups: 5-6 months, 8-9 months
    - 20 younger (8 female, M = 5 months 29 days, range 5 months 3 days – 6 months 23 days)
    - 20 older (10 females, M = 8 months 12 days, range 7 months 11 days-9 months 29 days)

1. Study 1: Native discrimination of statement/yes-no question

- Results: Both age groups display longer listening times to the novel test trials



Infants are able to discriminate utterances that differ only in the prosodic features that cue statements and questions, as early as 5 months, in the presence of segmental variability

ANOVA: within-subject factor trial type familiar/ novel) and two between-subject factors age group (younger/older) and habituation (statement/ question)

- Significant difference between same and switch test trials ($F(1,36) = 54.18$, $p < .001$, $\eta^2 = .6$)

- No effect of age group ($F(1,36) = 2.13$, $p = .15$, $\eta 2 = .06$)

- No effect of habituation ($F(1,36) = 2.02$, $p= .16$, $\eta^2 = .05$

- No significant interactions (trial type x age group $F(1,36) = 3.29$, $p = .08$, $\eta^2 = .08$; other, $F(1, 36)<1$).

Paired T-tests: significant difference between same and switch trials for younger ($t(19) = 6.1$, $p < .001$, $d = 1.474$) and older ($t(19) = 4.42$, $p < .001$, $d = 0.816$) groups.

1. Early discrimination: Study 2

Sundara, Molnar & Frota (2015) 18th ICPhS, in progress

- Non-native discrimination: English-learning and Basque-learning infants' perception of the EP sentence type distinction

Language	Statement	Yes/no question	Cues
English	The ball is red. **L%**	Is the ball red? **LH% or H%**	Word order Intonation
Portuguese	A bola é vermelha. **L%**	A bola é vermelha? **LH%**	Intonation
Basque	Baloia gorria da. **L%**	Baloia gorria (al) da? **HL%**	Intonation
Northern Spanish	La pelota es roja. **L%**	La pelota es roja? **HL% or H%**	Intonation

Ladd 2008; Frota 2014; Elordieta & Hualde 2014; Hualde & Prieto 2015

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English-learning infants **fail**

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Portuguese	A bola é vermelha. **L%**	A bola é vermelha? **LH%**	Intonation
Basque	Baloia gorria da. **L%**	Baloia gorria (al) da? **HL%**	Intonation
Northern Spanish	La pelota es roja. **L%**	La pelota es roja? **HL% or H%**	Intonation

Soderstrom et al. 2011; Geffen, 2014; Geffen & Mintz, 2014

1. Non-native discrimination: Study 2
English infants, EP statement/yes-no question

Phonetic salience

General early sensitivity to pitch contrasts predicts early discrimination

- Participants
  - 22 infants (from English homes in the Los Angeles area): 4 months

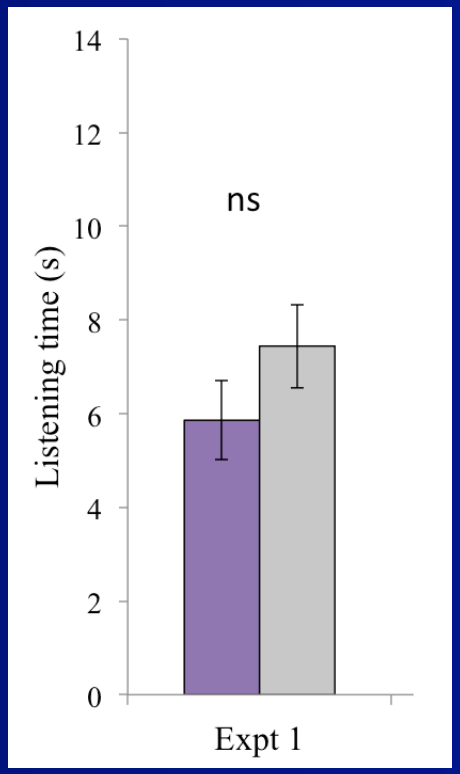
    12 female, M = 127 days,

    Range 114 days – 148 days

    - From the literature on infant perception, no differences in discrimination abilities are expected between 4 and 5-month olds (Sato et al. 2009, for lexical pitch accent [HL / LH]; Yeung et al. 2013 for lexical tone [high-rising/mid level] also Weikum et al. 2007 for visual language discrimination)

1. Non-native discrimination: Study 2
English infants, EP statement/yes-no question

- Results: Unlike EP-infants, English-learning infants fail to discriminate the statement/question contrast



ANOVA: Habituation Condition (statement, question) and Trial-type (familiar, novel) as the independent variables and listening time as the dependent variable

- No efect of Habituation $F(1, 20)=0.003$, $p=0.9$
- No effect of Trial type $F(1, 20)=3.5$, $p=0.07$
- No interaction $F(1, 20)=1.1$, $p=0.3$

English infants do NOT show an early sensitivity to the prosodic features that cue statements and questions in EP, in the presence of segmental variability

1. Non-native discrimination: Study 2

Basque infants, EP statement/yes-no question

Phonetic salience

General early sensitivity to pitch contrasts predicts early discrimination

- Adresses the possibility that English infants difficulties are simply due to the non-native nature of Portuguese stimuli > if so, Basque infants are expected to fail

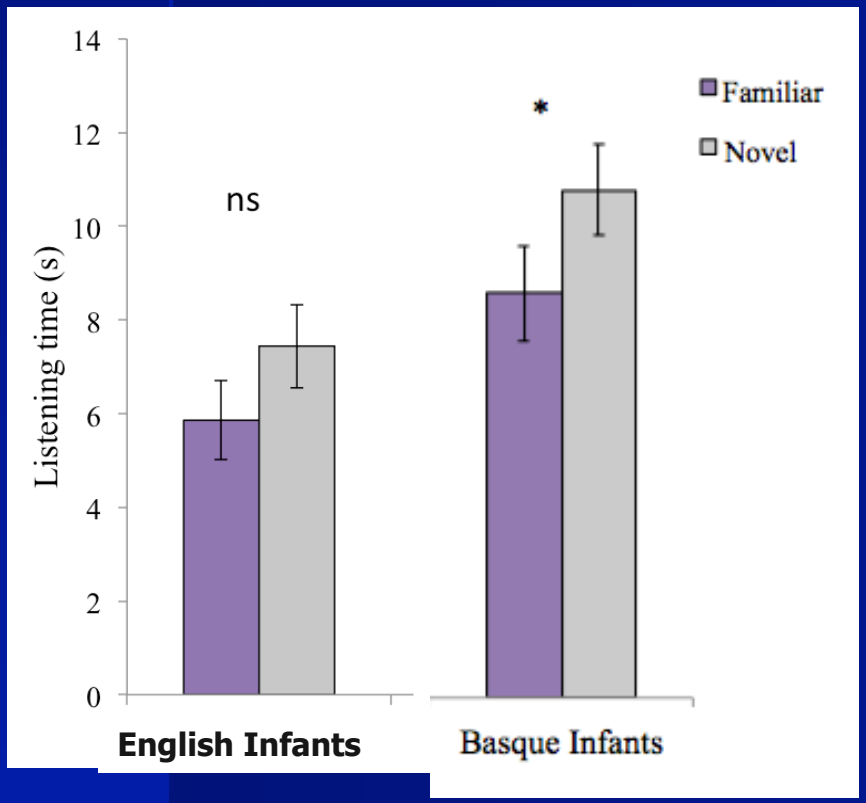
- Participants
  - 21 monolingual Standard Basque-learning 4-month-olds

    12 female, M = 130 days,

    Range 114 days – 134 days

1. Non-native discrimination: Study 2
Basque infants, EP statement/yes-no question

- Results: Unlike English-learning infants, Basque-learning infants are successful



ANOVA: Habituation Condition (statement, question) and Trial-type (familiar, novel) as the independent variables and listening time as the dependent variable

- Significant effect of Trial type $F(1, 19)=6.7$, $p=0.02$

- Also a main effect of Habituation $F(1, 19)=5.2$, $p=0.03$

- No interaction $F(1, 19)=.6$, $p=0.4$

Basque infants successfully categorized EP statements and questions, like their Portuguese peers

1. Early discrimination: Study 2
Summary

- Non-native discrimination: English-learning and Basque-learning infants' perception of the EP statement/question distinction

Language	Cues	Results
English	Word order Intonation	X
Portuguese	Intonation	✔
Basque (Northern Spanish)	Intonation	✔

- English-learning infants' difficulty is not simply due to non-native nature of the stimuli

- Native language experience influences the perception of pitch contrasts (boundary tones) early in development

1. Early discrimination: Study 3

Frota, Butler, Lu & Vigário (2016) Speech Prosody, in progress

- Non-native discrimination: EP-learning infants' perception of Mandarin tone and Japanese pitch accent contrasts: all falling/low vs. rising/high contrasts

Language	Statement(-like)	Question(-like)	Prosody
Portuguese	**H+L* L%**	**H+L* LH%**	Intonation (phrasal)
Mandarin Chinese	**Tone 1 + Tone 4** H HL	**Tone 1 + Tone 2** H LH	Tone (mora/syllable)
Japanese	**HL pattern**	**LH pattern**	Pitch accent (word)

Wang et al., 2001; Braun & Johnson, 2011; Broselow et al. 1987; Sato, Sogabe & Mazuka, 2009

1. Early discrimination: Study 3

Frota, Butler, Lu & Vigário (2016) Speech Prosody, in progress

- Non-native discrimination: EP-learning infants' perception of Mandarin tone and Japanese pitch accent contrasts: all falling/low vs. rising/high contrasts

Phonetic salience

General early sensitivity to pitch contrasts predicts early discrimination

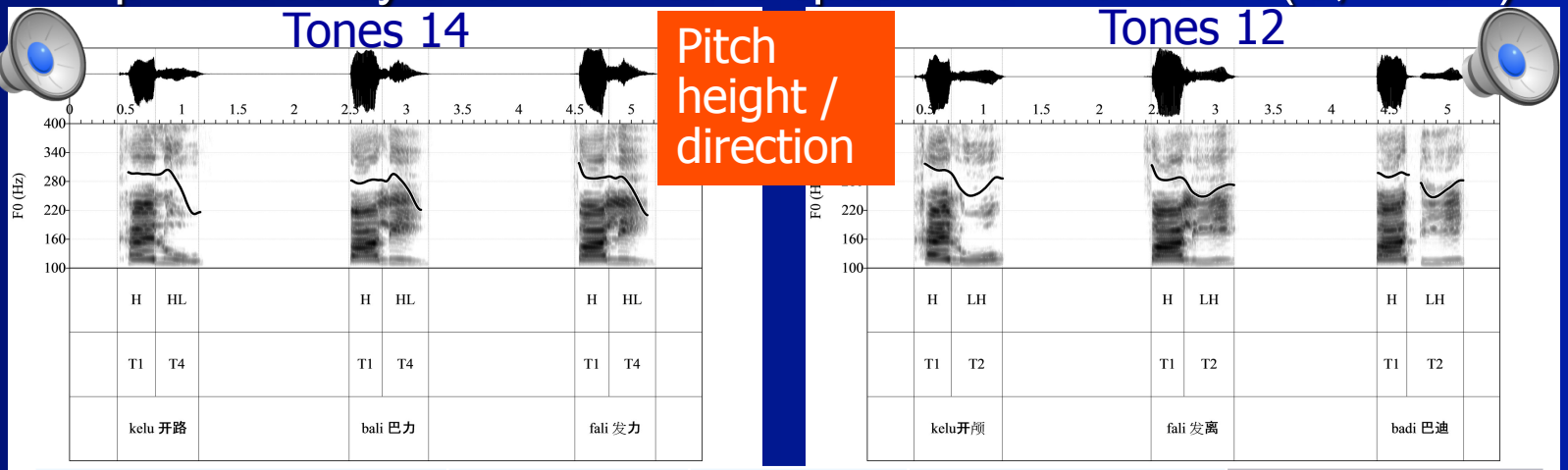
Effects of language experience predict NO discrimination

Similar overall contour shapes predict early discrimination

Pitch accent contrast expected to be closer to the tune than the lexical tone contrast

1. Early discrimination: Study 3
EP infants, Mandarin T1+T4 / T1+T2

- Materials: Segmentally varied bisyllabic (pseudo-)word produced by a female native speaker of Mandarin (C, V=EP)



Acoustic analysis	Tones14	Tones12	t-test	t-test (EP)
F0 Peak height 1st syll (Hz)	306	306	.172, *p* = 87	.16, p = .91
F0 range 1st syll (Hz)	11	10	.74, *p* =. 47	0.12, p = .9
F0 range 2nd syll (Hz)	-103	35	34.94, *p* < .001	23.46, p<.001
Final F0 (Hz)	205	284	28.16, *p* < .001	23.61, p<.001
Duration (ms)	763	801	4.87, *p* < .01	11.91, p<.001

1. Early discrimination: Study 3
EP infants, Mandarin T1+T4 / T1+T2

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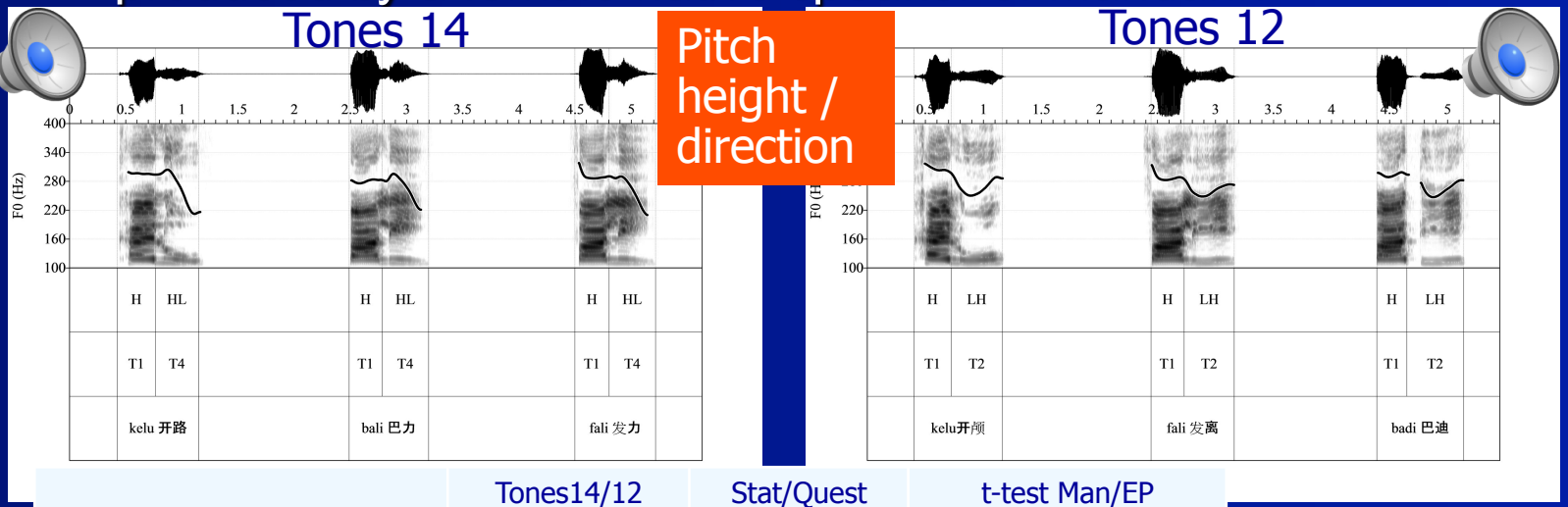


	Tones14/12	Stat/Quest	t-test Man/EP
F0 patterns 1st syll	H / H	HL / HL	-
F0 patterns 2nd syll	HL / HLH	L / LH	-
F0 range 2nd syll (Hz)	103/35	25/192	-
Duration 1st syll (ms)	270/279	310/397	$p = .07$ / $p < .001$
Duration 2nd syll (ms)	493/522	310/437	$p < .01$ / $p < .01$

Differences between the EP and Mandarin prosodic contrasts

1. Non-native discrimination: Study 3

EP infants, Mandarin T1+T4 / T1+T2

Phonetic salience

General early sensitivity to pitch-based contrasts predicts early discrimination

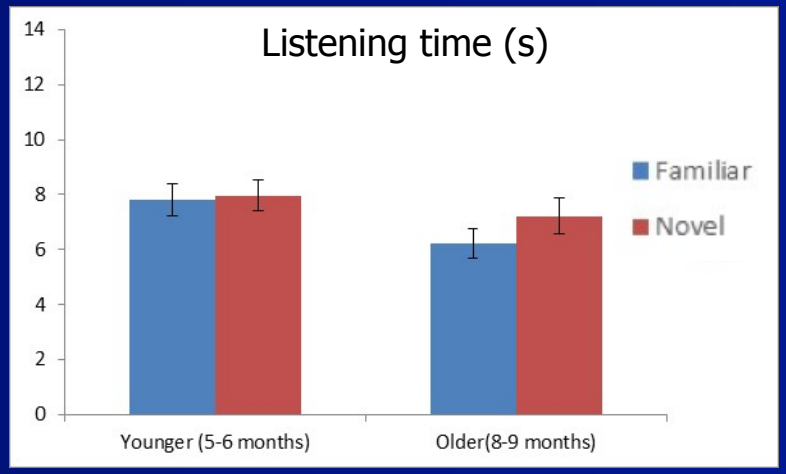
- Participants
  - 40 infants (from monolingual homes in the Lisbon area) split into two age groups : 5-6 months, 8-9 months (as in Study 1)
    - 20 younger (8 female, M = 5 months 25 days, range 5 months 2 days – 6 months 19 days)
    - 20 older (10 females, M = 8 months 21 days, range 7 months 13 days-10 months 8 days)

Similar overall contour shapes predict early discrimination

Effects of language experience predict NO discrimination

1. Non-native discrimination: Study 3
EP infants, Mandarin Tones 14 / 12

- Results: Unlike in the intonation contrast, EP infants fail to discriminate the lexical tone contrast



EP-learning infants do NOT show an early sensitivity to the prosodic features that cue the Mandarin Tone contrast, in the presence of segmental variability

ANOVA: Habituation Condition (statement, question) and Trial-type (familiar, novel) as the independent variables and listening time as the dependent variable

Younger

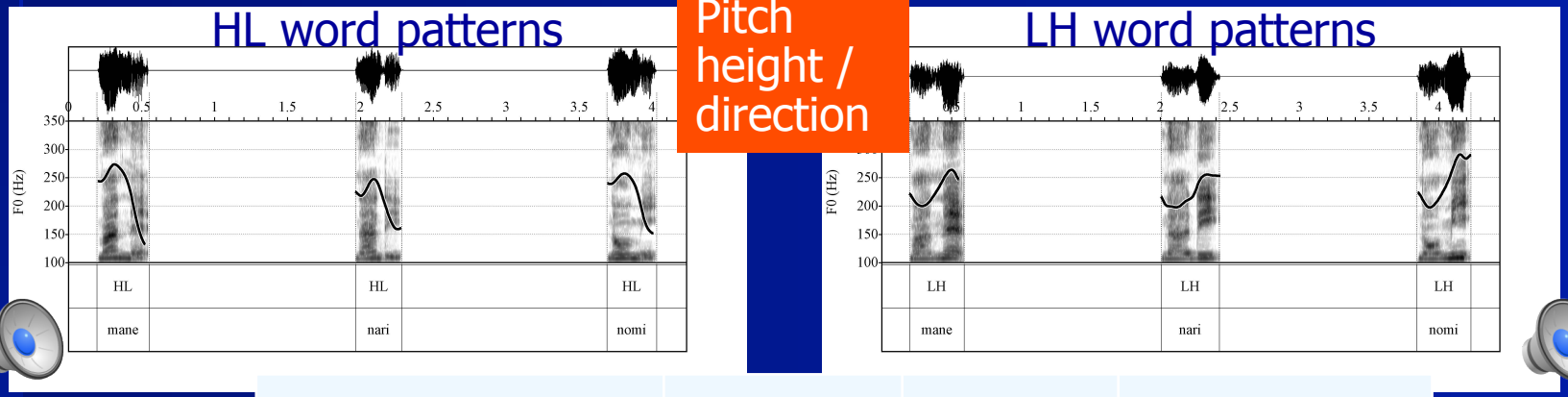
No effect of Trial type ($F(1,18) = .07$, $P = .79$, $\eta^2 = .00$); No effect of hab ($F(1,18) = .21$, $p = .65$, $\eta^2 = .01$); No interaction ($F(1,18) = .93$, $p = .35$, $\eta^2 = .05$)

Older

No effect of Trial type ($F(1,18) = 1.45$, $p = .25$, $\eta^2 = .07$), no effect of hab ($F(1,18) = .13$, $p = .72$, $\eta^2 = .01$), no interaction ($F(1,18) = .52$, $p = .48$, $\eta^2 = .03$)

1. Early discrimination: Study 3
EP infants, Japanese HL and LH word patterns

- Materials: Segmentally varied bisyllabic (pseudo-)word produced by a female native speaker of Japanese (C, V=EP)



	HL/LH	Stat/Quest	t-test Jap/EP
F0 patterns 1st syll	H / L	HL / HL	-
F0 patterns 2nd syll	L / LH	L / LH	-
F0 range 2nd syll (Hz)	122/75	25/192	$p < .001$ / $p < .001$
Duration 1st syll (ms)	141/165	310/397	$p < .01$ / $p < .001$
Duration 2nd syll (ms)	190/232	310/437	$p < .001$ / $p < .01$

(materials from Sato, Sogabe & Mazuka 2009)

1. Non-native discrimination: Study 3
EP infants, Japanese HL and LH word patterns

Phonetic salience

General early sensitivity to pitch-based contrasts predicts early discrimination

- Participants
  - 48 infants (from monolingual homes in the Lisbon area) split into two age groups : 5-6 months, 8-9 months (as in Study 1)
    - 24 younger (11 female, M = 6 months 3 days, range 4 months 28 days – 7 months 11 days)
    - 24 older (13 females, M = 9 months 3 days, range 7 months 19 days-10 months 20 days)

Similar overall contour shapes predict early discrimination

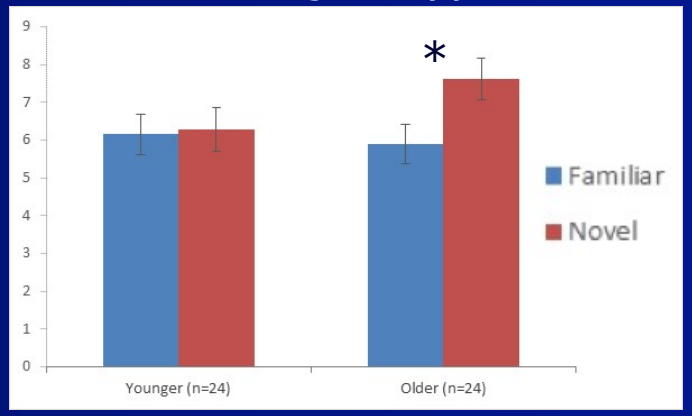
Effects of language experience predict NO discrimination

Pitch accent contrast expected to be closer to the tune than the lexical tone contrast

1. Non-native discrimination: Study 3
EP infants, Japanese HL and LH word patterns

- Results: The older age group of EP infants, but not the younger, discriminates the pitch accent contrast

Listening time (s)



ANOVA: Habituation Condition (statement, question) and Trial-type (familiar, novel) as the independent variables and listening time as the dependent variable

Younger

No effect of Trial type ($F(1,22) = .00$, $p = .99$, $\eta^2 = .00$), no effect of hab ($F(1,22) = .37$, $p = .55$), no interaction ($F(1,22) = .1$, $p = .75$, $\eta^2 = .75$

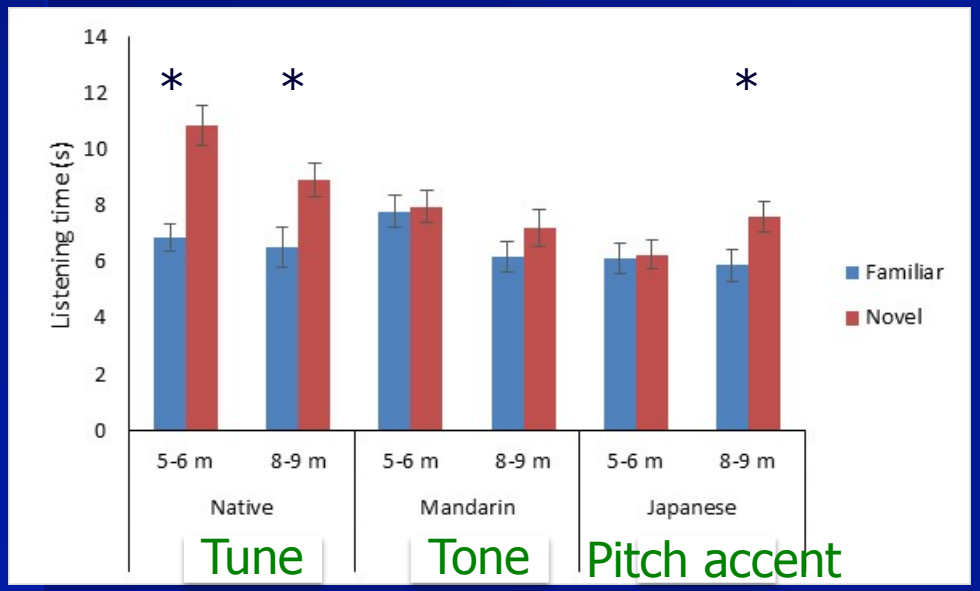
Older

Significant effect of Trial type ($F(1,22) = 5.72$, $p < .05$, $\eta^2 = .21$), no effect of hab ($F(1,22) = .25$, $p = .62$, $\eta^2 = .01$), no interaction ($F(1,22) = .09$, $p = .77$, $\eta^2 = .00$

Sensitivity to the prosodic features that cue the Japanese pitch accent contrast was found for the **older** infants

1. Early discrimination: Study 3
Summary

- Non-native discrimination: EP-learning infants' perception of the Mandarin and Japanese lexical pitch contrasts



A GLMM was used (along the lines of Skoruppa et al. 2013)

- Effect of language ($F(2,122) = 8.26$, $p < .001$)

. Borderline interaction Language x Age ($F(2,122) = 2.91$, $p = .058$

EP vs. Mandarin: only an effect of language ($F(1,76) = 15.28$, $p < .001$)

EP vs. Japanese: effect of language ($F(1,84) = 11.7$, $p < .01$) and interaction Language x Age ($F(1,84) = 5.68$, $p < .05$)

1. Early discrimination of statement (-like) and question(-like) prosody: Summary & Discussion

Language (Tune)	Cues	Results
English	Word order Intonation	X
Portuguese	Intonation	✔
Basque (Northern Spanish)	Intonation	✔

Language	Statement(-like)	Question(-like)	Results
Portuguese (Tune)	**H+L* L%**	**H+L* LH%**	Younger ✔ Older ✔
Mandarin Chinese (Tone)	**Tone 1 + Tone 4** H HL	**Tone 1 + Tone 2** H LH	Younger X Older X
Japanese (Pitch accent)	**HL pattern**	**LH pattern**	Younger X Older ✔

1. Early discrimination of statement (-like) and question(-like) prosody: Summary & Discussion

- Findings do NOT support

General early sensitivity to pitch-based contrasts, independent from the native language (early discrimination expected)

Phonetic salience

Similar overall contour shapes (similar discrimination patterns)

- By contrast, they point to the influence of native language experience on infants' perception

Effects of language experience (different discrimination patterns)

Native listeners

Differences in discrimination abilities

Cues available in the language

Tune ≠ Tone & Pitch accent; Pitch accent contrast closer to tune

2. Novel word learning and intonation

- Discrimination studies strongly suggest early ambient language effects (e.g., Yeung et al. 2013), rather than general discrimination abilities for statement(-like) and question(-like) prosody, involving a pitch height & direction difference, in the presence of segmental variability
- Whether and when do infants assign a function to the native prosodic contrast they perceive as early as 5 months?
- Young learners' interpretation of phonetic variation: meaningless variation; variation that conveys meaning≈phonological contrast (at what level)

2. Novel word learning and intonation

- Previous word learning studies, including EP

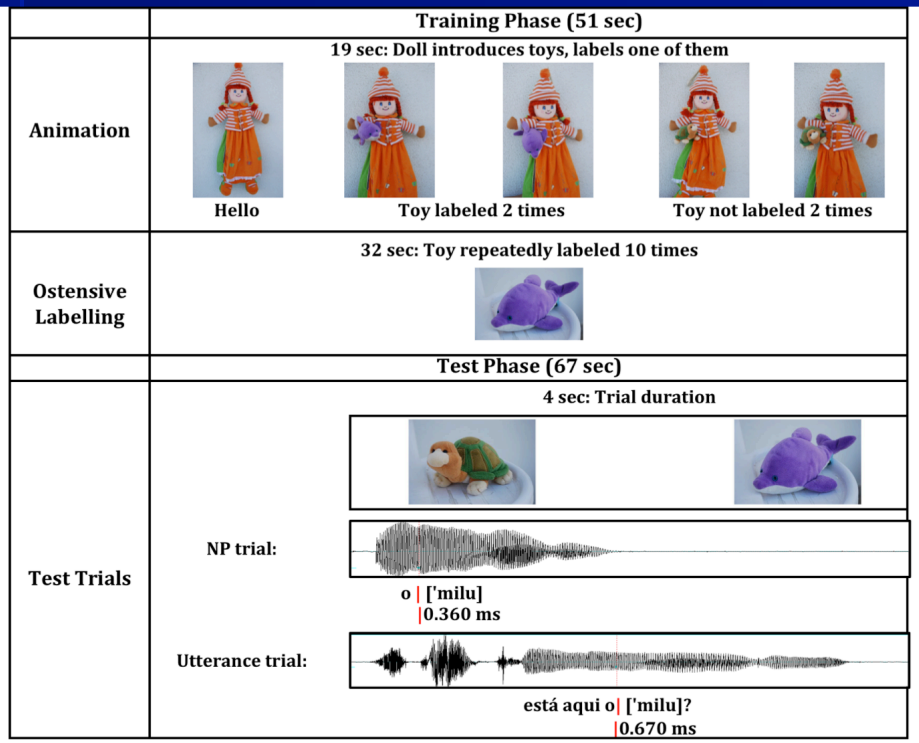
Type of contrast	Language	Age
Stress	English EP	1;2 ✔ 1;0 ✔; 2;0 ✔; 3;0 ✔; 4;0 (✔)
Tone (Tone 2, Tone 4) (Rising, Falling)	Mandarin-English *English(-X) *English	1;6 ✔; 2;0 ✔; 3;0 ✔; 4;0 (✔) 1;6 ✔; 2;0 X 1;2 ✔; 1:5 (X) ;1;7 X
Tune	English (Rise-fall, Level) EP (statement, question)	2;6 X 1;0 ✔; 2;0 ✔; 3;0 X; 4;0 X
Vowel	English Mandarin-English	< 2;0 ✔; 2;6 ✔ 3;0 (✔); 4;0 ✔

Curtin, 2009; Curtin et al., 2009; Quam & Swingley, 2010; Frota et al., 2012; Singh et al., 2014, 2015; Hay et al., 2015

2. Novel word learning and intonation: Study 4

Frota, Butler, Correia, Severino & Vigário (2012) 36th BUCLD, 190-201
Frota et al., submitted

- Findings that EP learners are sensitive to statement/ question prosody in a novel word learning task (lexically irrelevant pitch is NOT ignored)



An eyegaze-based procedure (similar to Quam & Swingley 2010) where visual fixation to the labeled picture in the training phase is the response variable

2. Novel word learning and intonation:
Study 4

- Auditory stimuli:

Exp1

Stress contrast: penult / final [**mi**lu] / [mi**lu**]

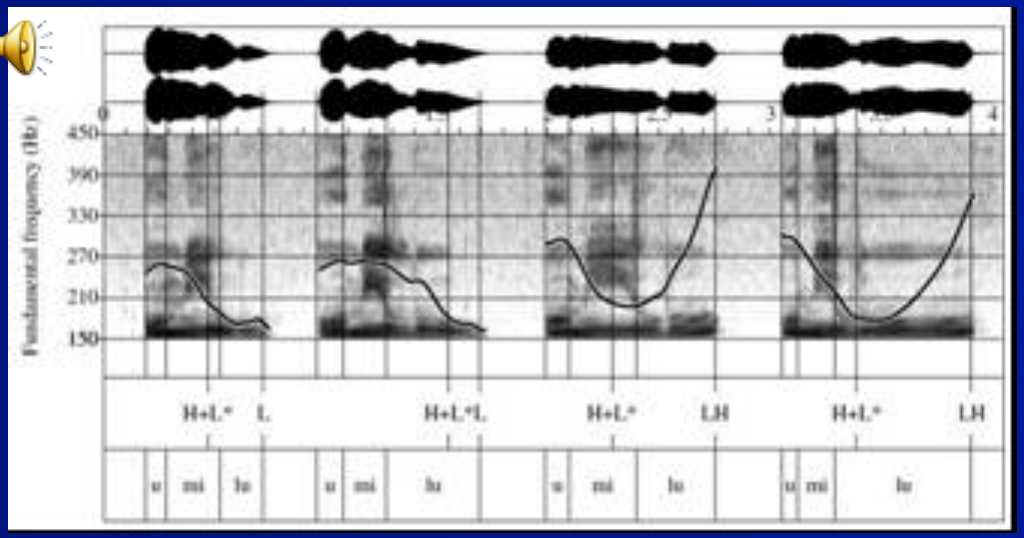
– Stress can be lexically contrastive (as in English, Spanish)

Pitch contrast: declarative / interrogative (H+L* **L%** / H+L* **LH%**)

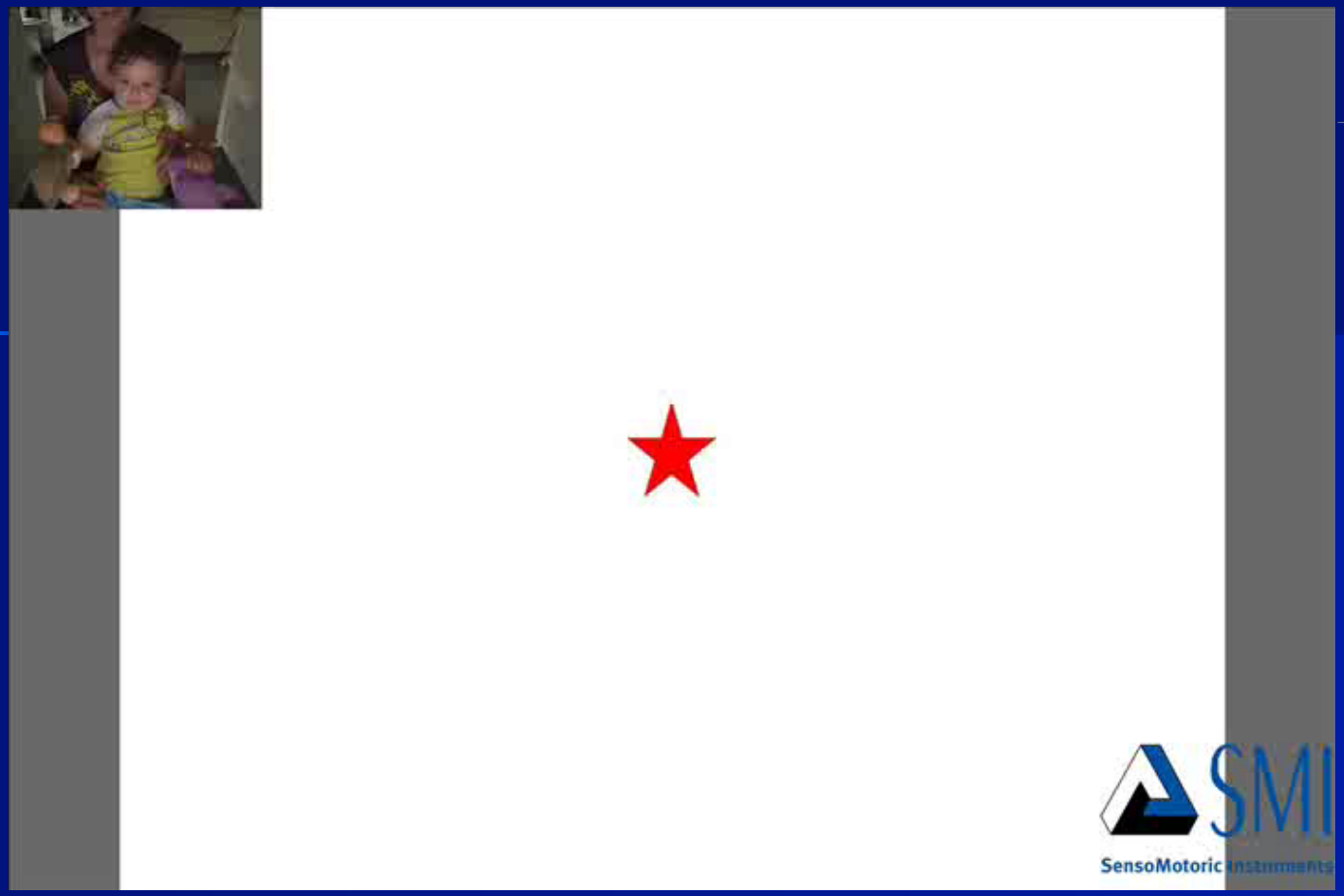
Exp2

– Intonation contrast not lexically relevant

Vowel contrast: [i] and [a] [milu] / [**ma**lu]



Trained label
Deviant labels:
Stress Change
Intonation Change
Vowel Change



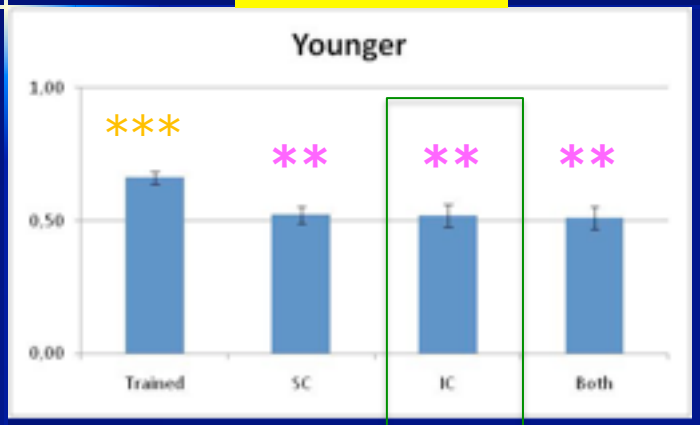
Coding for analysis: For each subject in each test trial, proportion looking time at the labeled object picture 'A' (looking at 'A' divided by the total looking time for both pictures)

- We used two time windows after the onset of the target word: 367+2000 ms for 1&2 year-olds, 367+1500 ms for 3&4 (Fernald et al. 1998, Swingley & Aslin 2002, Gredebäck et al. 2010, Gonzalez-Gomez, et al., 2013)

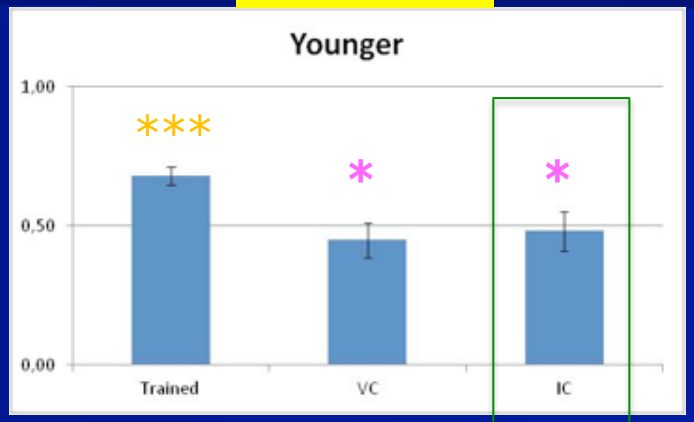
2. Novel word learning and intonation:

Study 4 - Proportion looking time to the labeled object picture

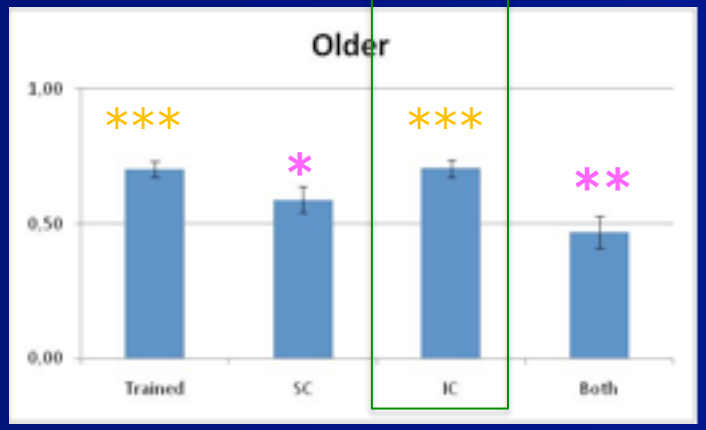
Exp1 (n=48)

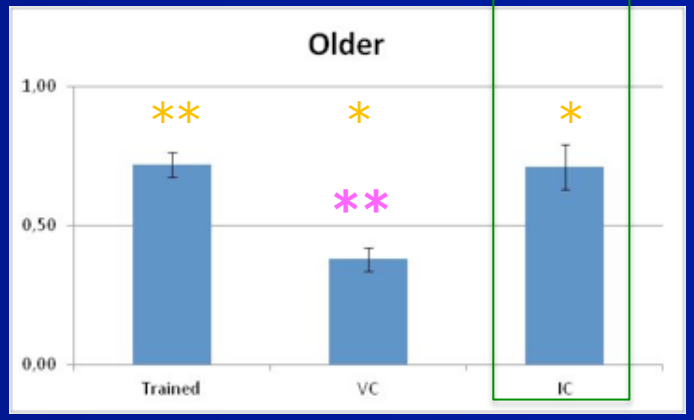


Exp2 (n=24)



Younger: 1-year olds and 2-year olds





Older: 3-year olds and 4-year olds

Significant results against change

Significant difference from trained

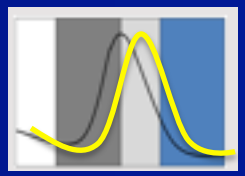
2. Novel word learning and intonation:
Summary & Discussion

- Whether and when do infants assign a function to the native prosodic contrast they perceive as early as 5 months?
- EP learners regard statement/question prosody as relevant in a novel word learning task by 1;0; only at 3;0 they interpret the prosodic contrast as lexically irrelevant
- Although at odds with native language phonology, EP learners respond differently to one-word utterances depending on their statement or question prosody, showing that the prosodic contrast affects meaning

3. Other linguistic contrasts cued by prosody

- Early ambient language effects, rather than general discrimination abilities where shown for statement(-like) and question(-like) prosody, involving a pitch height & direction difference, in the presence of segmental variability
- EP learners treat the statement/question prosodic contrast as relevant to meaning
- Prosodic cues to linguistic categories vary across and within languages: Does the nature of the pitch cues matter?

Final pitch (boundary tones)



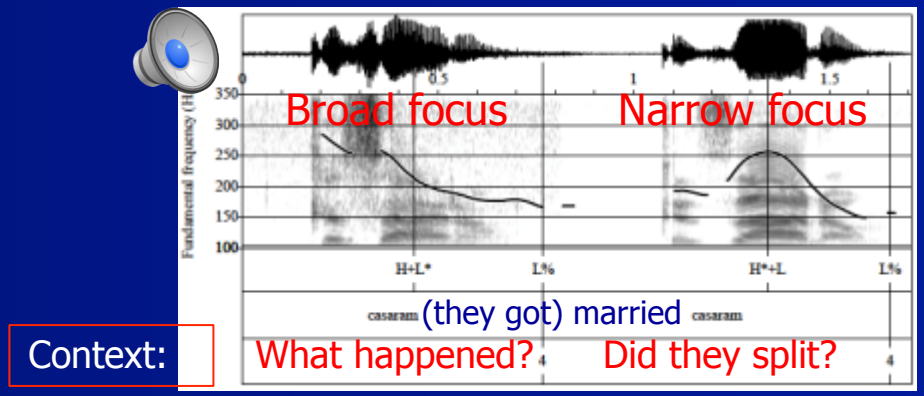
Peak alignment

Questions, Neapolitan Italian
Focus, EP

3. Other linguistic contrasts cued by prosody: Study 5

Butler, Vigário & Frota (2016) Language Learning & Development

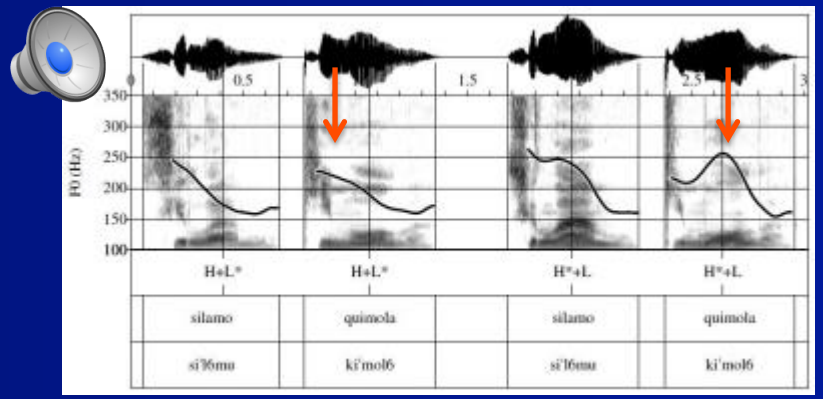
- The broad/narrow focus distinction



  - Broad focus: the whole sentence expresses new information; Narrow focus: a particular element is the relevant part of the utterance (identification, contrast/correction, Krifka 2007, Gussenhoven 2008, Ladd 2008)
  - Main cue pitch alignment: broad focus **H+L***L%; narrow focus **H*+L** L%
  - Longer durations in narrow focus; Peak height is optional (Frota 2000, 2002)
  - The prosodic contrast is perceived by adult native speakers (Frota 2012)

3. Other linguistic contrasts cued by prosody: Study 5 – Broad vs. Narrow focus

- Materials: Segmentally varied one pseudo-word utterances produced by a female native speaker in infant-directed speech



Pitch timing: early/late alignment of the pitch fall

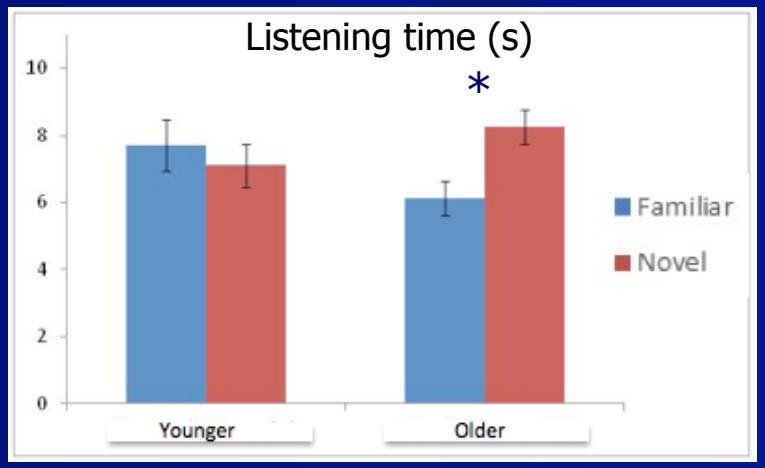
Acoustic analysis	Focus	Neutral	t-test
F0 peak (Hz)	249.79	230.8	7.4, $p < .001$
F0 low (Hz)	160.26	161.53	1.05, $p = .31$
Timing of the fall (ms)	140	- 29	22.12, $p < .001$
Duration pre-tonic (ms)	101	159	6.95, $p < .001$
Duration stressed (ms)	262	254	1.22, $p = .24$
Duration post-tonic (ms)	236	229	1.49, $p = .16$

3. Other linguistic contrasts cued by prosody: Study 5 – Broad vs. Narrow focus

- Participants
  - 40 infants (from monolingual homes in the Lisbon area) split into two age groups: 7 months, 12 months
    - 20 younger (10 female, M = 6 months 28 days, range 6 months– 8 months 3 days)
    - 20 older (9 females, M = 12 months 7 days, range 10 months 16 days-14 months 6 days)
- Procedure
  - Same as all previous discrimination studies
  - If sensitive to the intonational contrast, infants should display longer listening times to the novel (different) trials

3. Other linguistic contrasts cued by prosody: Study 5 – Broad vs. Narrow focus

- Results: Only the older infants display longer listening times to the novel test trials



Difference in discrimination abilities for the **statement/question** prosodic contrast (as early as 5 months), and for the **broad/ narrow focus** contrast only by 12 months

The nature of the pitch cues seems to matter!

4. General Discussion

- Statements and Questions: the ability to distinguish between them is crucial
- Prosody is frequently the key: prosodic discrimination abilities as a prerequisite for the acquisition of Questions
- Our findings do NOT support general discrimination abilities for pitch contrasts across languages: Similar contour shapes > different discrimination patterns
- Effects of language experience emerge early in the 1st year and may constrain young learners' interpretation of phonetic variation as meaningful (phonological contrast)

4. General Discussion

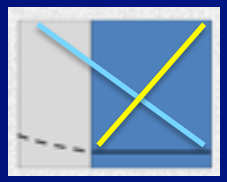
- Perceptual trajectory of prosodic contrasts may depend on the primary cues involved (pitch height & direction vs. pitch alignment)
  - relating to previous reports on diffs. between infants' perception of lexical pitch, stress and duration contrasts

- Discrimination abilities as a prerequesite for the aquisition of linguistic categories cued by prosody > our findings suggest an advantage of certain prosodic cues over others with implications for the **acquisition of distinctions cued by prosody**, within and across languages

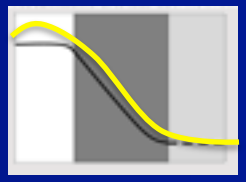
Questions and prosody

My language!

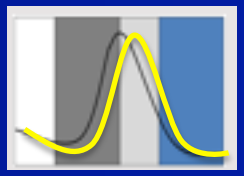
Final pitch (boundary tones)



Peak height



Peak alignment



Thanks to all the families and nurseries that have taken part in these studies.

Obrigada

Thank you

DEPE: PTDC/CLE-LIN/108722/2008
EBELa: EXCL/MHC-LIN/0688/2012
H21: PTDC/MHC-LIN/3901/2014

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University of Konstanz, October 4-6 2017

Early perception of the prosody of statements and questions

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