

# Lecture 2

## Intonation and emotion, affect, & illocutionary force

CN MSc course 'Language Acquisition', 3 March 2011

Instructor: Aoju Chen

# The pre-verbal stage (1)

- A variety of vocalisations by two months of age
  - Categories of sounds in English-listening two-month olds (Legerstee 1991)
    - Long sounds with variable pitch contours (melodic)
    - Nasal-like sounds with flat pitch (vocalic)
    - Sounds (cries, fussing, laughing) (emotional)
- Infants modulate sounds depending on contexts
  - from Legerstee's (1991) study
    - More melodic sounds when conversed with by mother or another woman than in any other context
    - more vocalic sounds when adults were not unresponsive
    - More emotional sounds to people than to objects
- -> control over vocal productions from early on

# The pre-verbal stage (2)

- Changes in pitch range and contour shape as a function of (social) contexts (age range: 4 ~ 9 months)
  - Presence vs. absence of the mother
    - Call cries & request (non-cry) vocalisations vs. discomfort cries
      - Pitch register
        - Call cries > discomfort cries (in level contours and to a less extent rising contours) > request vocalisations
      - Contour types
        - More rises in call cries (mostly rises) & request vocalisations than in discomfort cries (mostly falls and levels)
  - With vs. without eye contact with the mother
    - Higher pitch register and more rises in vocalisations produced with eye contact

# The pre-verbal stage (3)

- Vary pitch and duration to express communicational intentions at 10 months
  - Expressing infant's participation in interpersonal exchanges
    - E.g. looks at/touches/seekes/searches mother, shows, offers etc.)
  - Reflecting internal perceptual and cognitive processing ('thinking aloud')
    - E.g. holds/inspects objects
- Main findings
  - A higher mean  $f_0$ , and max  $f_0$  in interpersonal exchanges
  - A shorter duration in interpersonal exchanges (why?)

# The late babbling and one-word stage (1)

- Requests
  - Social gestures central to our everyday life (Garvey 1974)
  - The earliest 'acts of meaning' present in children (Halliday 1975)
- The use of initial pitch and contour shape in requests vs. labelling in French infants (Marcos 1987)
  - Two types of requests
    - Initial requests: first or sole request for an object or for co-operation
    - Repeated requests: only for objects
  - A cross-sectional design involving 2 groups of infants (1;2 ~ 1;10)
  - Elicitation methods for labelling and requests
  - Data: all babbles, proto-words and words
  - Judgments of function based on:
    - The infant's gestures
    - The mother's responses
    - The infant's reactions to the mother's responses

# The late babbling and one-word stage (2)

- Vocabulary size
  - At 1;2: only 1 infant produced recognisable words
  - At 1;5: all the infants used one or several words
  - At 1;9: only 2 infants reached the stage of two-word utterances
- Initial pitch
  - repeated requests > initial requests (significant at 1;3 $\frac{1}{2}$ , 1;6 $\frac{1}{2}$ , 1;8)
  - Initial requests > labeling (significant at 1;2, 1;3 $\frac{1}{2}$ , 1;5, 1;6 $\frac{1}{2}$ )
  - No age/vocabulary size related effect on the use of pitch

# The late babbling and one-word stage (3)

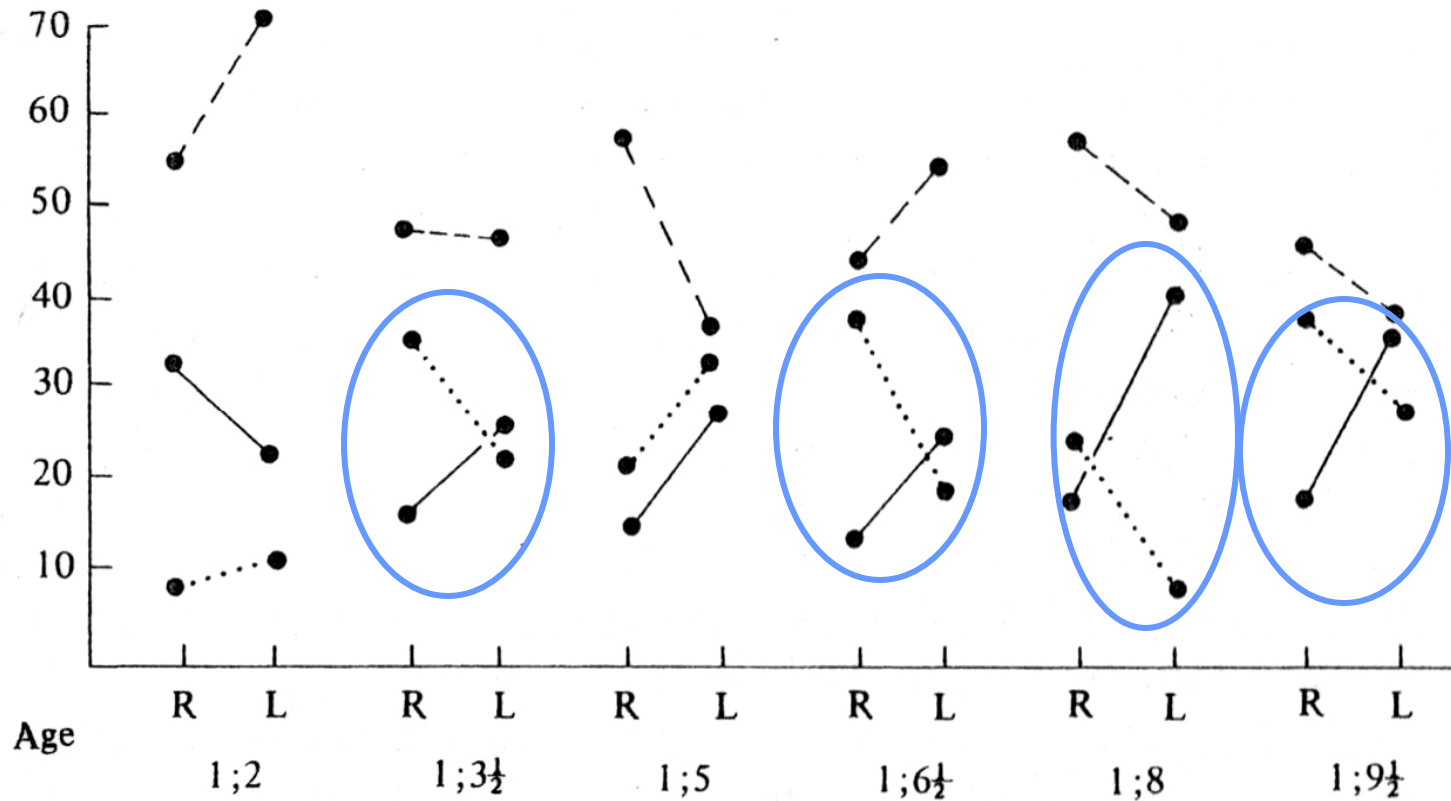


Fig. 1. Percentage of falling, rising and level contours for requests and for labelling at each age level. R: requests; L: labelling; ....., rising contour; —, falling contour; ----, level contour.

(Marcos 1987)

# The late babbling and one-word stage (4)

- Individual differences in the use of intonation in a range of functions
  - 3 English-listening infants
    - age at time of testing: RS - 0;11.09, AB - 1;0, AL- 1;2.24
  - Audio- and videotaped three times (1 hour/session) over a period of about 6 months while playing with the mother
    - 1st tapping: before the onset of single words
    - 2<sup>nd</sup> tapping: when vocabulary consisted of 10 words
    - 3<sup>rd</sup> tapping: when vocabulary consisted of 50 words
  - Data included
    - Babbling
    - Single-word utterances
    - Non-word like vocalisations during the one-word utterance stage



# The late babbling and one-word stage (5)

- Function categories
  - Requests
    - for object or action
    - for attention
    - for response
    - in loud voice and repeated until mother complied
    - Response to other's speech
  - Comment-(non)Interactive
  - Protest
  - ...
- Acoustic analysis
  - Mean pitch
  - Max pitch
  - Pitch span
  - Final contour (rise vs. non-rise)

# The late babbling and one-word stage (6)

- Differences in the use of rise
  - between children (AL-54%, 14%, 12%, for each child respectively)
  - between function categories
- Similarities in the use of rise
  - Consistency over time of the overall % of total rises within each child (AL > RS, AB)
  - The % of rises in a particular category was consistent within each child across time
    - The greatest % of rises in requests
    - Frequent use of falls in comment-(non)interactive, response to others' speech, repeated requests until mother responded

# The late babbling and one-word stage (7)

- Mean pitch, pitch maximum
  - Higher in requests for attention and protest than in other functions
- Pitch span
  - Requests for attention: greatest span
  - Response to others' speech: narrowest span

# The late babbling and one-word stage (8)

- Similarities between French- and English-listening infants and continuity from pre-verbal stage to early verbal stage
  - Similarities in the form-function relations in adult French and English?
  - Intonation universals
    - The biological codes (Gussenhoven 2002, 2004)
  - Teasing apart cross-linguistic similarities in the grammar from (paralinguistic) intonation universals
    - e.g. risings statements in Belfast English (Jarman & Cruttenden 1976) and Chicksaw (Gordon 1999); falling questions in Roermond Dutch (Gussenhoven 2000) and Chicksaw

# Sensitivity to intonational cues to emotion and affect (1)

- 2-month-olds
  - Looking longer at visual stimuli upon hearing rising 'ba' than hearing falling 'ba' in a female voice (Sullivan & Horowitz 1983)
- 3-month-olds
  - showing fear when hearing an angry voice (Popich 2003)
- 4-month-olds
  - Looking longer at visual stimuli upon hearing approving rise-fall than hearing disapproving rise-fall (Papousek et al. 1990)

# Sensitivity to intonational cues to emotion and affect (2)

- Intonation, lexical content, & body language packed in a message
  - Words vs. paralanguage (intonation + body language)
    - At 9 months: responding more to paralanguage (Lawrence & Fernald 1993)
    - At 18 months: responding more to lexicon (Lawrence & Fernald 1993)
    - 15-months olds (Friend 2001)
  - Intonation vs. body language (e.g. Quam et al. 2009)
  - Intonation vs. words (e.g. Morton & Trehub 2001)

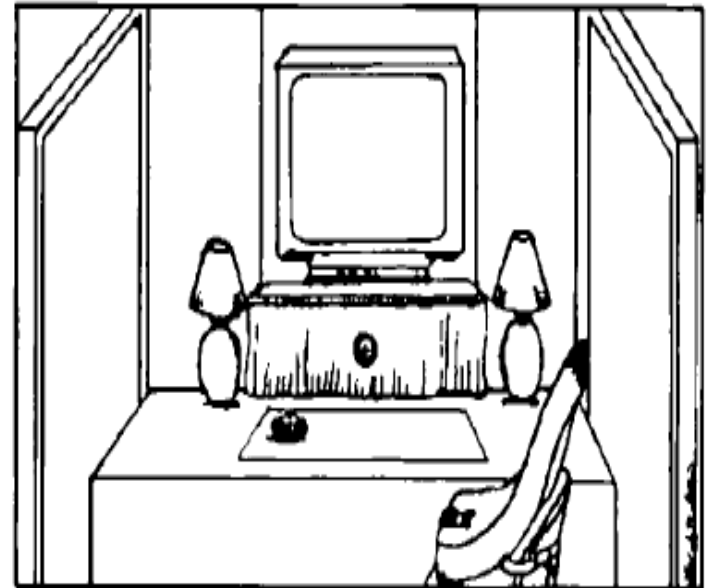
# Sensitivity to intonational cues to emotion and affect (3)

- Infants' interpretation of messages with approving or disapproving lexical content combined with approving or disapproving intonation and facial expressions
  - *Don't touch*
  - *Bad stop*
  - *Nice play*
  - *Good look*
- 63 infants (mean age: 15 months, 14m12d ~ 17m3d)

Friend (2001)

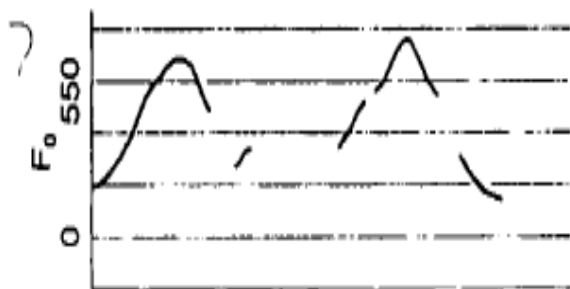
# Sensitivity to intonational cues to emotion and affect (4)

- Prior to testing parents were mailed a copy of the CDI with instructions to complete the instrument at home
- A 10-minute warm-up period
- Infant in high chair, parent holding magazine over his/her face (E1)
- One practice trial (familiarising with the testing situation)
- Four test trials
  - E2 placed novel toy on the tray, and moved the toy beyond the curtain
  - E 2 played the 1<sup>st</sup> videotaped stimulus
  - Toy within the infant's reach
  - Stimulus repeated
  - Toy remained within infant's reach for 15s





# Sensitivity to intonational cues to emotion and affect (5)

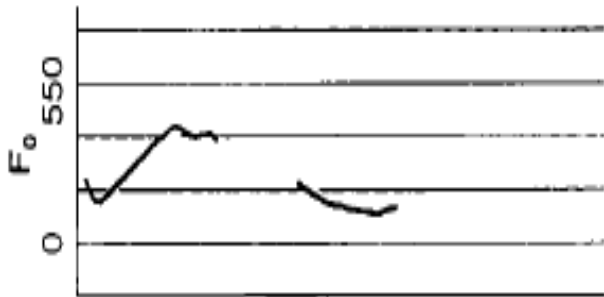


Nice play

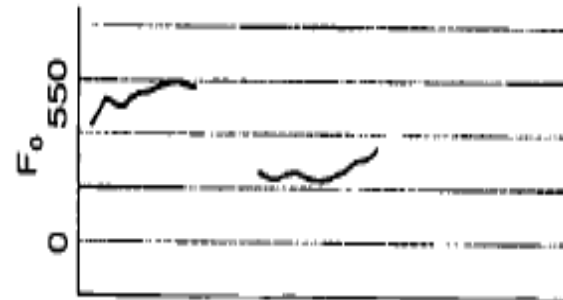


Nice play

# Sensitivity to intonational cues to emotion and affect (6)



Don't touch



Don't touch

# Sensitivity to intonational cues to emotion and affect (7)

- Between-subject Independent variables
  - (dis)agreement between lexicon and paralinguistics (intonation, facial expression)
    - Consistent (lexical content = paralinguistics)
    - Discrepant (lexical content  $\neq$  paralinguistics)
  - Stimulus order, Gender
  - Co-variants
    - Lexical item comprehended (total score 8)
      - Girls (5.13, 1 ~ 8) vs. Boys (4.35, 0 ~ 8)
    - Receptive vocabulary
      - Girls (198.16, 51 ~ 370) vs. Boys (162.68, 18 ~ 285)
- Dependent variables
  - Difference in 'delay to approach' between approving lexicon and disapproving lexicon
  - Difference in 'manipulation/play time' between approving lexicon and disapproving lexicon

# Sensitivity to intonational cues to emotion and affect (8)

## ■ Differences in 'delay to approach'

consistent

approving lexicon

-

disapproving lexicon

< 0

approving paralang

disapproving paralang

discrepant

approving lexicon

-

disapproving lexicon

< 0 (m) Lex

> 0 (m) para

disapproving paralang

approving paralang

# Sensitivity to intonational cues to emotion and affect (9)

## ■ Differences in 'manipulation time'

consistent

approving lexicon

-

disapproving lexicon

> 0

approving paralang

disapproving paralang

discrepant

approving lexicon

-

disapproving lexicon

> 0 (m) Lex

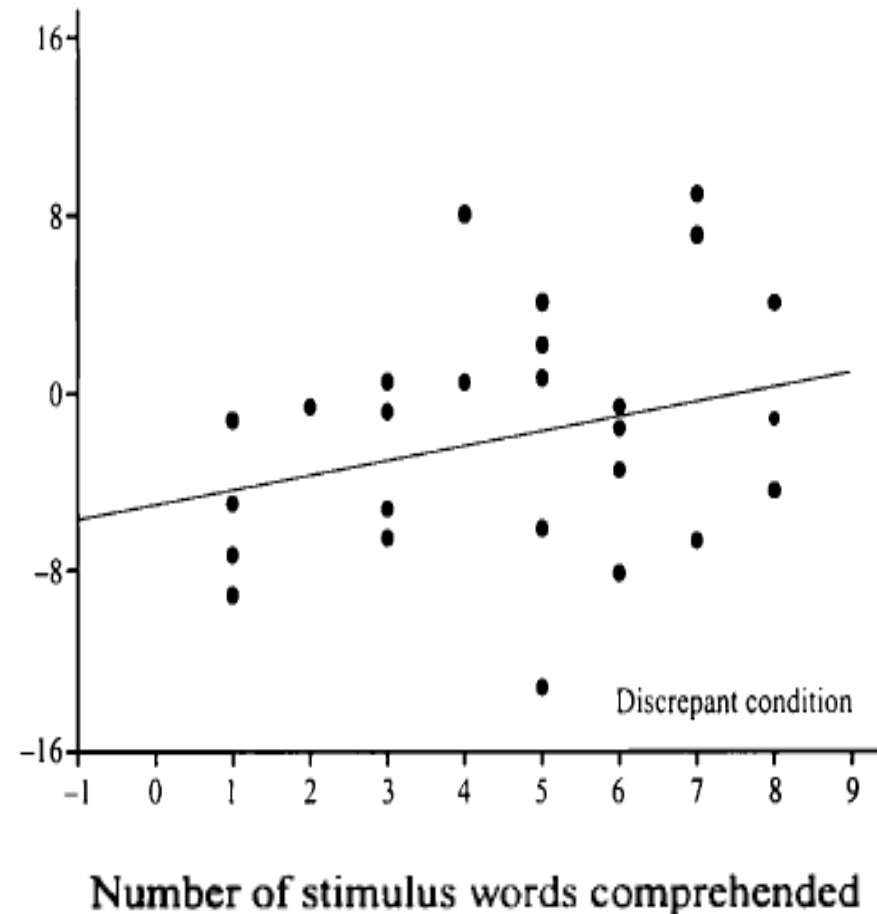
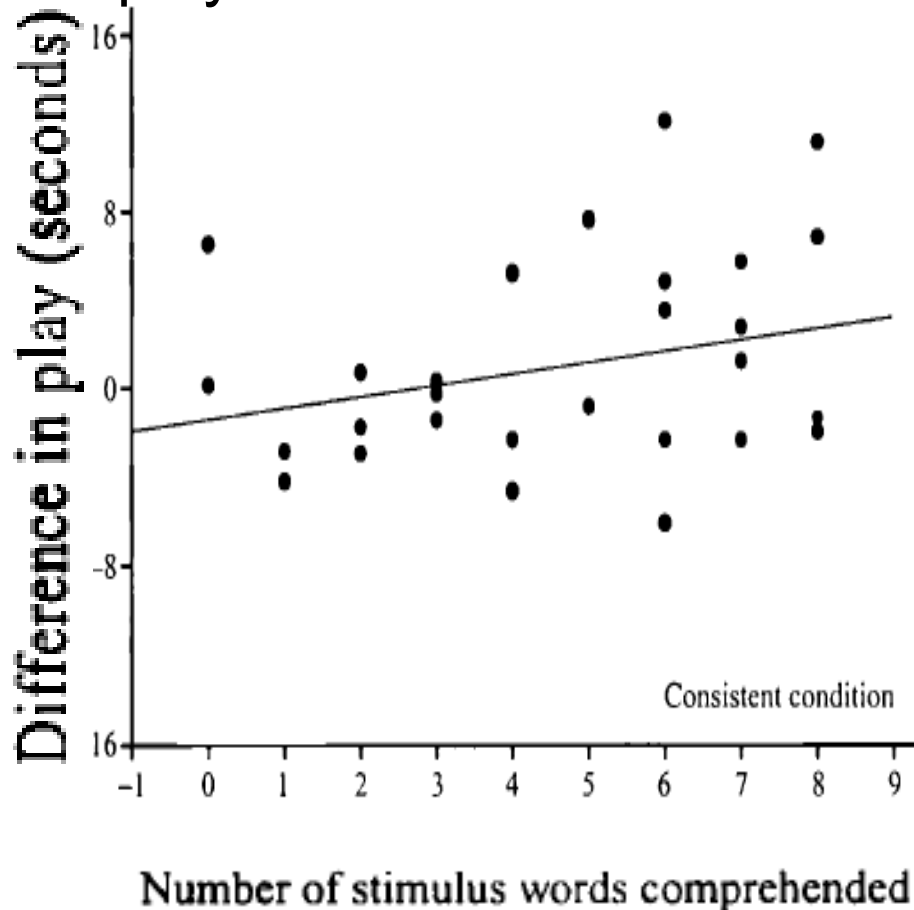
< 0 (m) para

disapproving paralang

approving paralang

# Infants' responsiveness to emotion and affect in the voice (11)

- Lexical comprehension was a significant predictor of infant play



# Sensitivity to intonational cues to emotion and affect (12)

- Why do some 15- and 18-months olds respond more to lexicon?
  - Processing limitations on the expression of meaning (Bloom 1993)
  - Impact of newly emerging lexicon
  - Not knowing what is the most reliable cue when multiple cues are present

# Sensitivity to intonational cues to emotion and affect (13)

- Children's use of intonation to infer a speaker's emotions
  - Exp. 1: Puppy searches for a toy (e.g., the *Toma*) on each trial. He is excited when he finds the *Toma*, and disappointed when he finds a different toy.
  - Task: Give Puppy the Toma, throw the other toys in the trash

## Condition 1: body-language cue

**Toy 1** (not Toma) Puppy shakes head, slumps

**Toy 2** (Toma) Puppy nods, dances

**Toy 3** (not Toma) Puppy shakes head, slumps

## Condition 2: pitch cue

**Toy 1** (not Toma) Low, flat pitch (on "Mmm")

**Toy 2** (Toma) High pitch, wide excursions

**Toy 3** (not Toma) Low, flat pitch

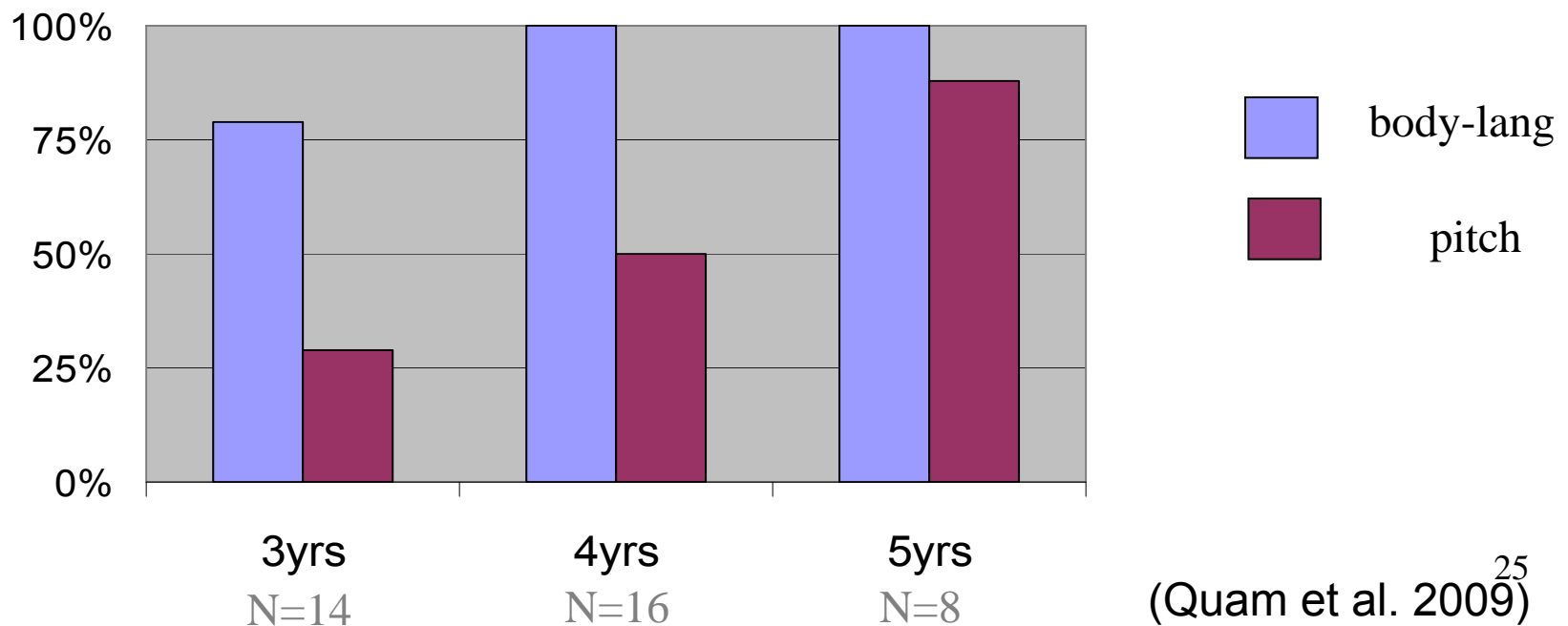


(Quam et al. 2009)



# Sensitivity to intonational cues to emotion and affect (14)

- Children's use of intonation to infer a speaker's emotions
  - Exp. 1: Puppy searches for a toy (e.g., the *Toma*) on each trial. He is excited when he finds the *Toma*, and disappointed when he finds a different toy.
  - Task: Give Puppy the *Toma*, throw the other toys in the trash



# Sensitivity to intonational cues to emotion and affect (15)

- Children's use of intonation to infer a speaker's emotions
  - Exp. 2: Puppy searches for his lost toy in each trial.
  - Task: If Puppy is happy, point to the happy face.  
If Puppy is sad, point to the sad face.

## Condition 1: body-language / facial cues

**Toy 1** (not lost toy) Experimenter frowns, she & Puppy slump

**Toy 2** (lost toy) Experimenter smiles, she & Puppy dance

## Condition 2: pitch cue (on 'Oh, look at that')

**Toy 1** (not lost toy) Low, flat pitch

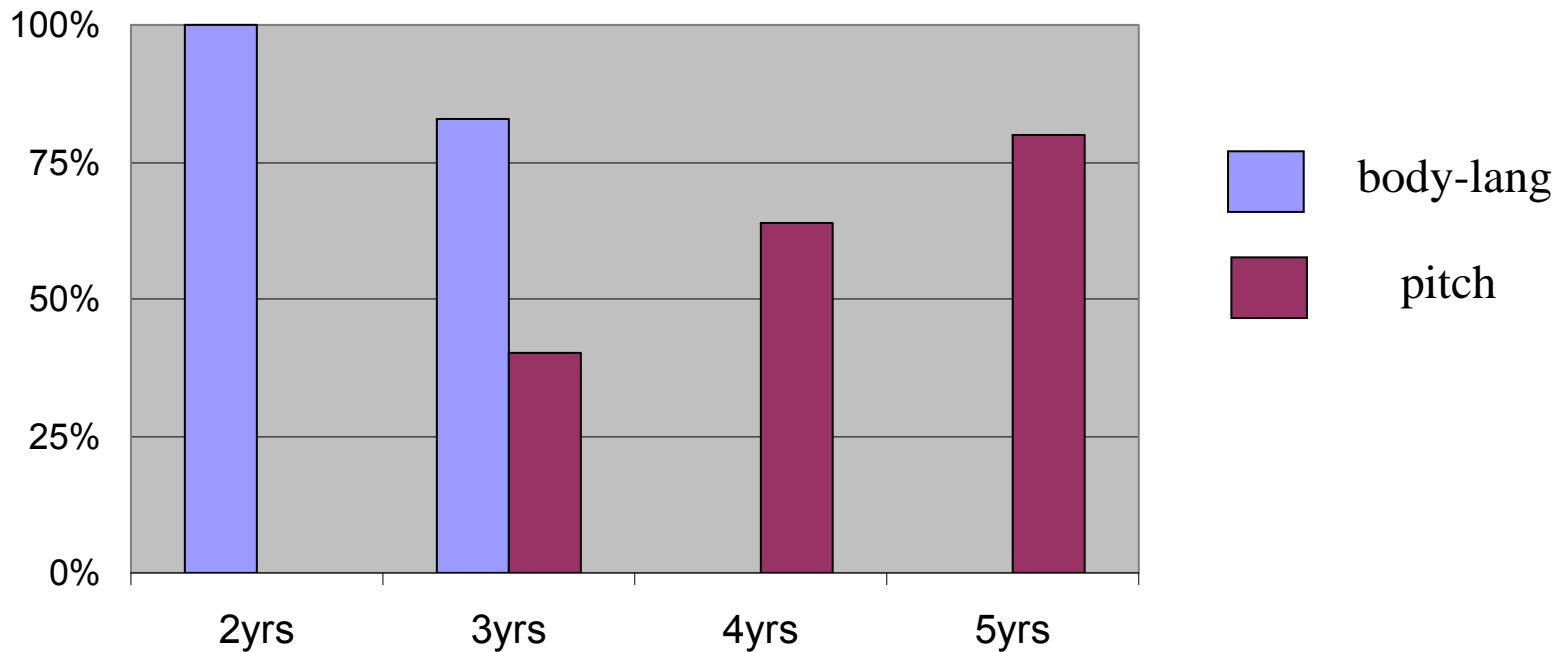
**Toy 2** (lost toy) High register, wide excursions



(Quam et al. 2009)

# Sensitivity to intonational cues to emotion and affect (16)

- Children's use of intonation to infer a speaker's emotions
  - Exp. 2: Puppy searches for his lost toy in each trial.
  - Task: If Puppy is happy, point to the happy face.  
If Puppy is sad, point to the sad face.



N=4  
N=1 (pitch)

N=6  
N=10 (pitch)

N=11

N=10

(Quam et al. 2009)

# Sensitivity to intonational cues to emotion and affect (17)

- Interpretation of 'happy' and 'sad' in messages with conflicting or non-conflicting intonation and lexical content
- Children's limited attentional resources
  - 3- and 4-year-olds' stories are rich in prosody but poor in content
  - 7- and 8-year-olds' stories are rich in content but poor in prosody

(Morton and Trehub 2001)

# Sensitivity to intonational cues to emotion and affect (18)

- Participants
  - 145 English-speaking children aged 4 to 10 (about 20 in each of the 7 age groups)
  - 20 adults (native speakers of English)
- Stimuli
  - 40 spoken utterances spoken by a female speaker
  - Duration does not differ for sentences with conflicting and non-conflicting cues
- Task: judge whether the speaker feels happy or sad

# Sensitivity to intonational cues to emotion and affect (19)

- Response latency measured from the stimulus onset to entry of response ('happy' or 'sad')
  - A longer response time to stimuli with conflicting cues (both children and adults)
- Implication: Children processed both sources of information and seemed to notice abnormality in the sentences

# Sensitivity to intonational cues to emotion and affect (20)

- Happy/sad judgments
  - Adults: exclusively based on intonation
  - 4-year-olds: primarily based on lexical content
  - Between 5 and 10 years of age: a decrease in their reliance on lexical content
  - Half of the 10-year-olds responded to intonation when the cues were conflicting
- Not an issue of understanding intonation
  - Morton & Trehub's Exp. 2 and 3
  - But see finding in Quam et al. (2009)
- But an issue of a limited understanding of the role of intonation in communication
  - when the words conflict with the intonation, they “do not treat intonational cues as a basis for qualifying or overriding the literal message” (Morton and Trehub 2001: 841)

# Sensitivity to intonational cues to emotion and affect (21)

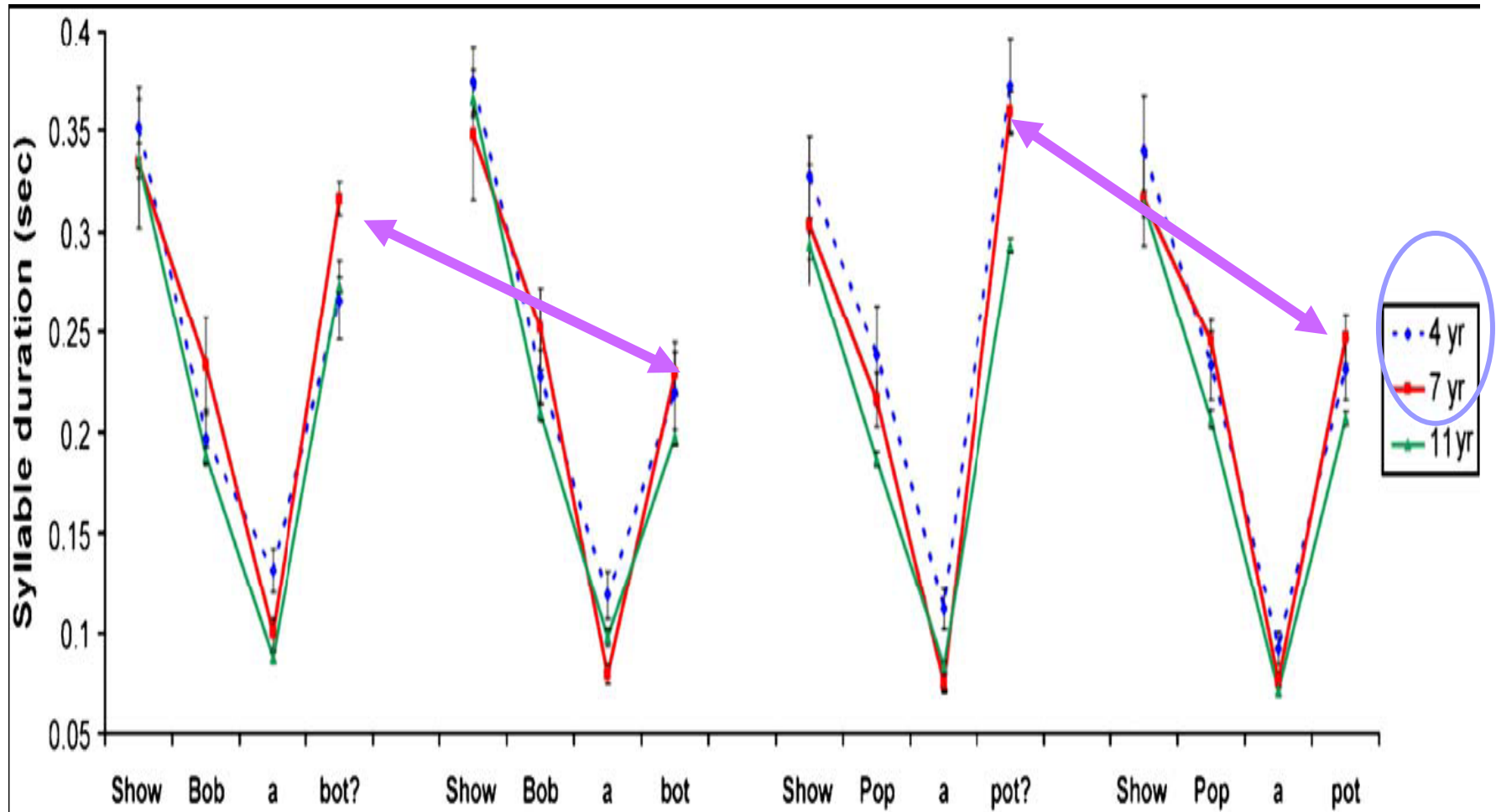
- Intonation, lexical content, & body language
  - Words vs. paralinguistic (intonation + body language)
    - 9 month-olds: responding more to paralinguistic (Lawrence & Fernald 1993)
    - 15-months olds: responding more to paralinguistic but .... (Friend 2001)
    - 18 month-olds: responding more to lexicon (Lawrence & Fernald 1993)
  - Intonation vs. body language (e.g. Quam et al. 2009)
    - Children younger than 5 failed to interpret pitch cues
  - Intonation vs. words (e.g. Morton & Trehub 2001)
    - Children younger than 10 relied on lexical content
- Concluding remarks
  - An astonishingly slow process
  - Individual differences?
    - e.g. in development of a sense of humor



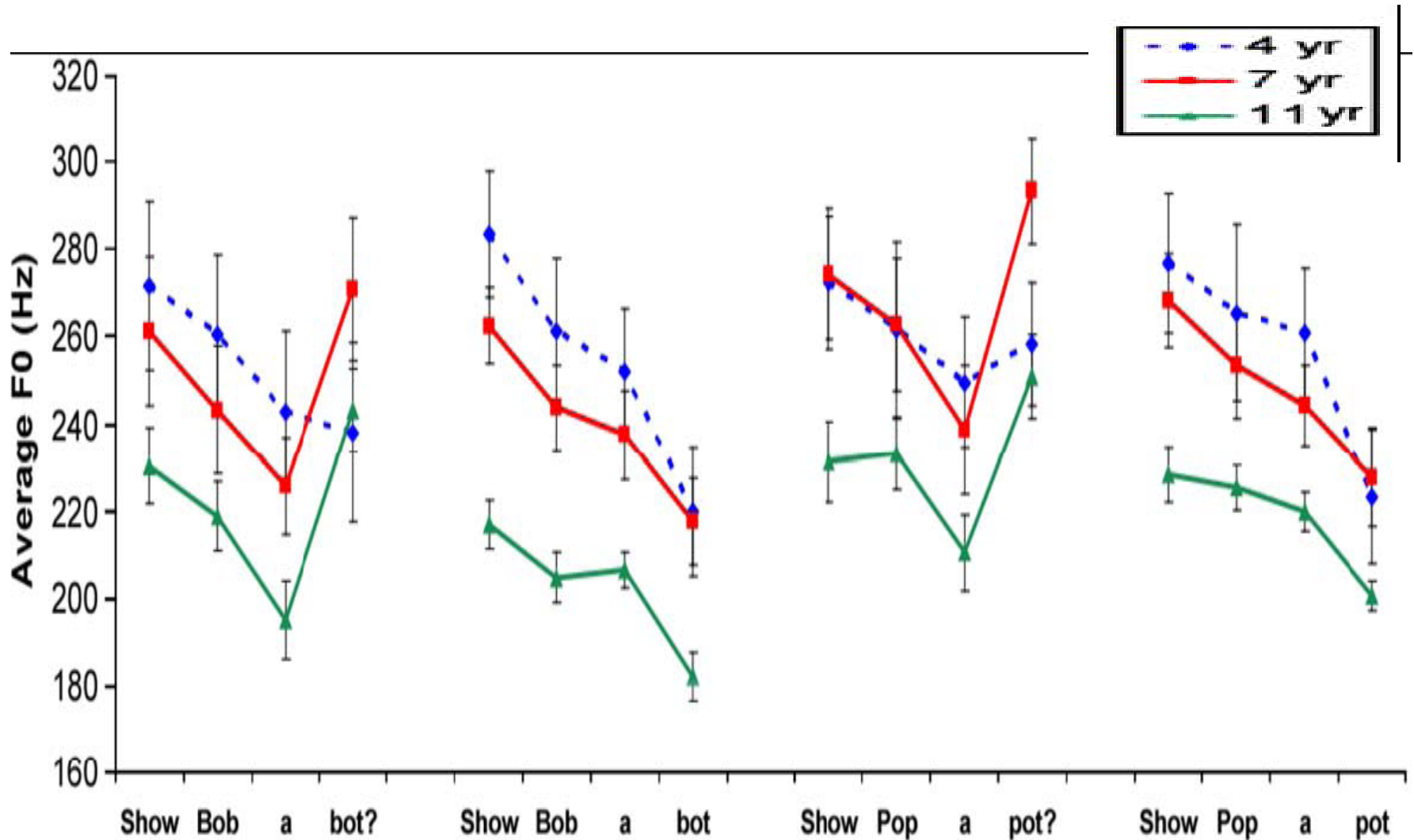
# Intonation & Illocutionary force (1)

- By age 5 children can use final rise to signal questions in imitative paradigms (Allen & Hawkins 1980, Loeb & Allen 1993, Snow 1994, 1998)
- Questions vs. statements in natural production at different ages (Patel & Grigos 2006)
  - 4 English-speaking children in 3 age groups (4;4, 7;4, 11;3)
  - Repetitions of two phrases spoken as statements & questions via a naturalistic elicitation technique
    - 4 puppets: Pop (grandpa), Bob (Sponge Bob), pot (a pot), bot (a robot)
    - Children's task: instruct the experimenter to perform an action using one character and one object
      - (Bob is lonely. What should I show Bob?) Show Bob a bot.
      - (Bob is hungry and needs something to make soup ...). Show a Bob a pot? (not a typical yes-no question)
  - Four variables (in each syllable): duration, mean F0, F0 slope, mean intensity (slightly higher in Q than in S, only significant in 7-yrs)

# Intonation & Illocutionary force (2)



# Intonation & Illocutionary force (3)



# Intonation & Illocutionary force (5)

- Age-related differences
  - 4-year-olds rely mostly on duration, as found in earlier work (Allen & Hawkins 1980)
  - 7-year-olds use all three cues in tandem
  - 11-year-olds use primarily  $f_0$  and their use of duration is less exaggerating than that of younger children, like adults
- Why less consistent use of final rise in the 4-year-olds?
  - More complex to rise pitch
    - The change in pitch slower in a rising contour than in a falling contour (Xu and Sun 2002)
    - 4-year-olds can imitate rising contours but with a smaller pitch span (Snow 1998)
  - Production of voiced plosives
  - Or....

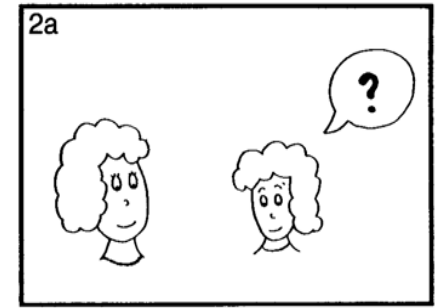
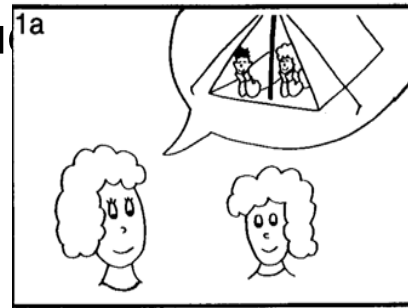
# Intonation & Illocutionary force (6)

- Question intonation in French children (Gérard & Clément 1998)
  - 3 speakers from each age group: 5 yrs, 7 yrs, 9yrs, adults
  - Picture-description

- *Maman dit* 'Mommy said' ... (statements)

- *Quoi* 'what?' (declarative qu<sup>1a</sup>

e.g. 'On emmène Michel en vacances'



- Main findings
  - Overall contour: all groups of speakers used rise in questions
  - Duration (of last syllable of each disyllabic word):
    - Adults: Longer duration in questions (only in 1<sup>st</sup> disyllabic word)
    - 7- and 9-yrs: opposite pattern (on different words)
    - 5-yrs: overall lengthening in questions

# Intonation & Illocutionary force (7)

- English 4-year-olds vs. French 5-year-olds
  - Final lengthening in both groups
  - Final rise in French children
    - Why this difference?

# Intonation & Illocutionary force (8)

- 2-year-olds rely on intonation rather than word order to identify questions in English (Leder & Egelston 1982)
  - Lack of knowledge of the function of inversion
- How accurately can children identify questions using only intonational cues? (a gating experiment by Gérard & Clément 1998)
  - At the whole-sentence level (on the 5<sup>th</sup> word)
    - Adults: perfect identification
    - 9-year-olds: very accurate identification (80%, 85%)
    - 7-year-olds: 65%, 55%
    - 5-year-olds: 20%
  - Anticipatory identification
    - Only present in adults (right from the 2<sup>nd</sup> word)
  - The results are surprising ....