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Pre-schoolers' categorisation of speakers by phonological variables

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How do **pre-school children** learn to group together speakers on the basis of **regionally distributed** features of **pronunciation?**

How is this ability impacted by the child's **Age** and **Sex** and the linguistic **Input** they receive?

Background

- **Adults** can group speakers into broad perceptual regional accent categories
  → Williams et al. (1999), Clopper & Pisoni (2004, 2007)

- The age at which **children** can use **regional accent** features in order to **group** speakers and how this **develops** is not clearly understood
  - **7-year-olds** (Floccia et al. 2009)
  - **5-year-olds** (Beck 2014)

- Categorising speakers by regional accent is a **life-long** skill
- But is there any evidence of this ability **emerging** in **pre-school** children?

Background

- Previous studies have uncovered the development of **sociolinguistic skills** in the **pre-school** years
- **Linguistic input** important

- Children learn **community norms** of pronunciation
  → Roberts & Labov (1995), Foulkes et al. (1999)
- Children's preference for **standard variables** is related to their exposure to standard forms
  → Smith et al. (2007), Barbu et al. (2013)

Background

- **Usage-based** theories of language acquisition best describe the importance of input
- Other theoretical models don't show how **the indexical meaning of sociophonetic variability** is learned (cf. Foulkes and Docherty 2006)

- Storing of specific **linguistic units** (cf. Tomasello 2003)

- Frequency of encounters aids acquisition (cf. Chevrot et al. 2009)

- Exemplars of **individual talker** differences → **broader groups** based on these differences (cf. Foulkes & Hay 2015)

- **More transparent** categories easier to learn – direct exposure important (cf. Foulkes and Docherty 2006)

Research questions

(1) To what extent can 3-4 year-olds group speakers by **phonetic variants** indexing **regional accents?**

(2) To what extent does their ability in (1) vary with **age, sex** and **input** from **different regional accents**?

- **Age:** Improvement through pre-school years?
- **Sex:** Difference between boys and girls?
- **Input:** Those who have parents from outside the local area (and are therefore exposed to a wider variety of accents at home) better in this ability?

Methodology

Participants

- 20 pre-school children in York (+ 4 discarded)
- 12 girls, 8 boys
- Aged 3.1 years to 4.6 years

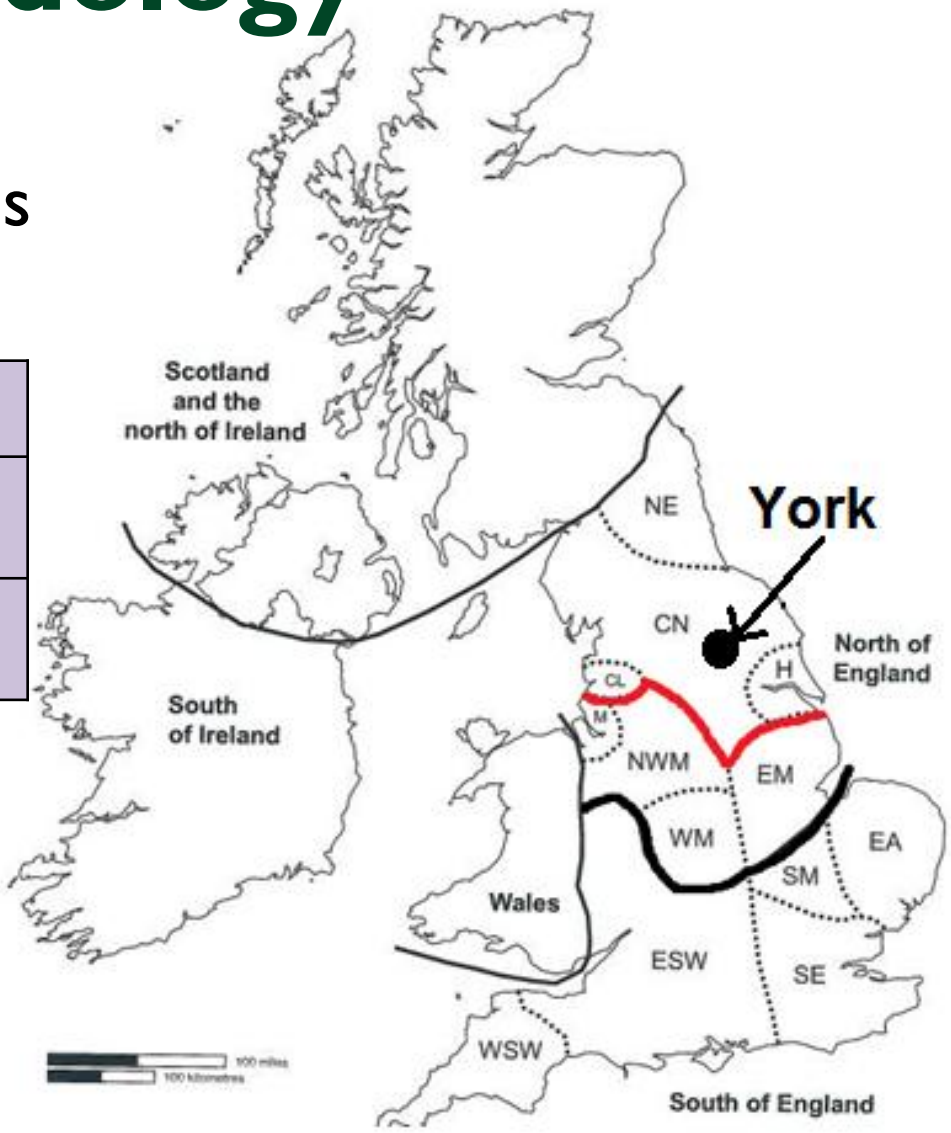
Experiment

- Sentences
- Two regional accents
- Single speaker
- Run on laptop in quiet corner of nursery or home

Methodology

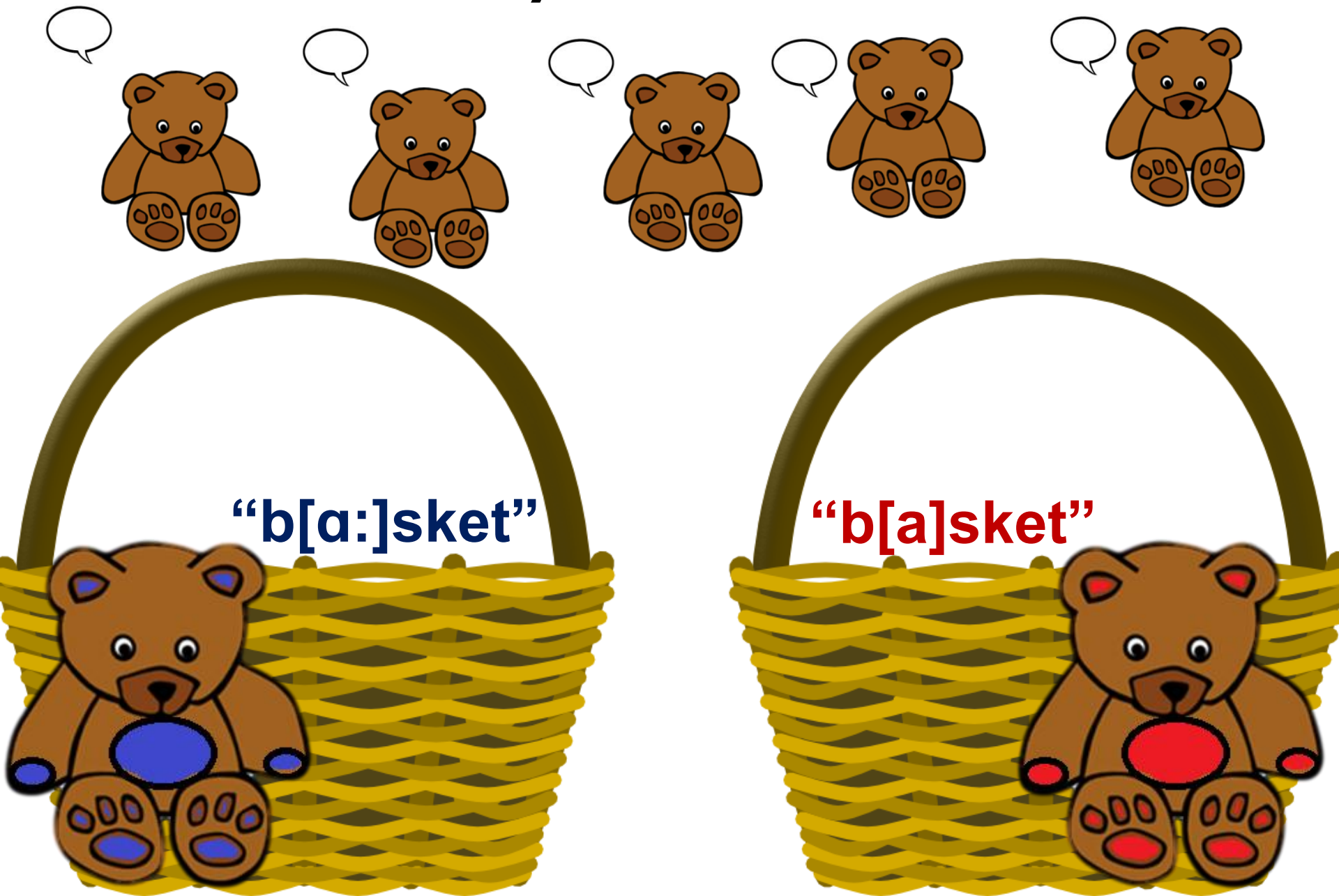
- **Regional accent** differences

	NORTH	SOUTH
bath, grass	[a]	[ɑ:]
face, gate	[e:]	[eɪ]



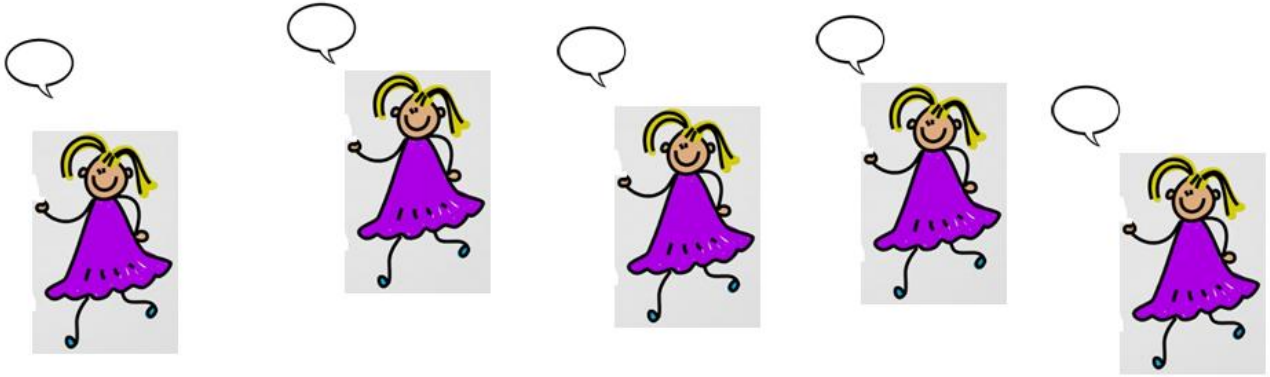
(Hughes et al. 2012:71)

Difficulty level 1: Same word



Difficulty level 2: Same phoneme

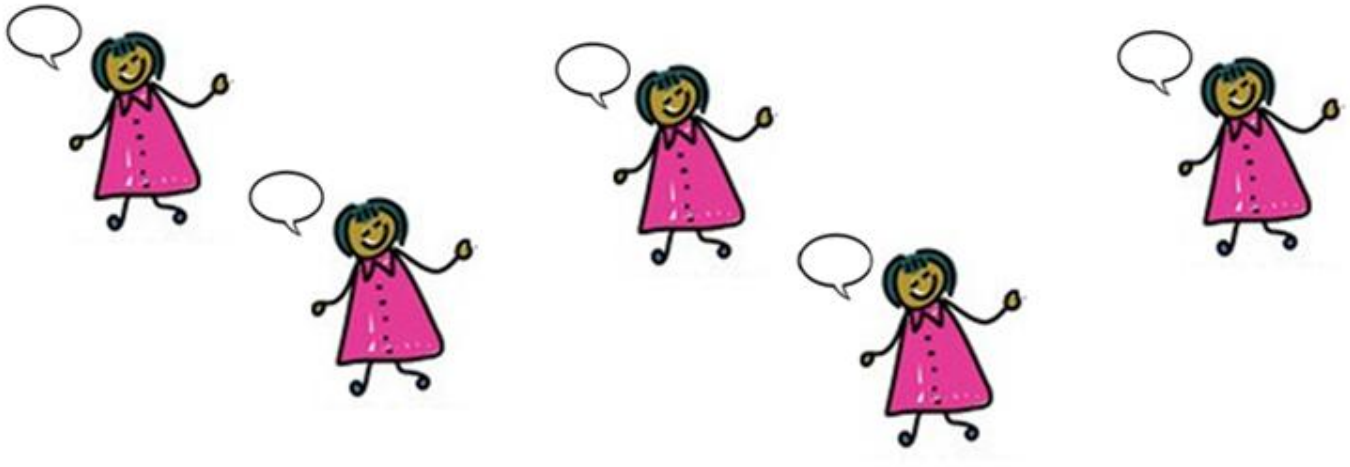
Daughters: *grass* [a]/[ɑ:]



Mothers: *path* [a]/[ɑ:]

Difficulty level 3: Different phoneme

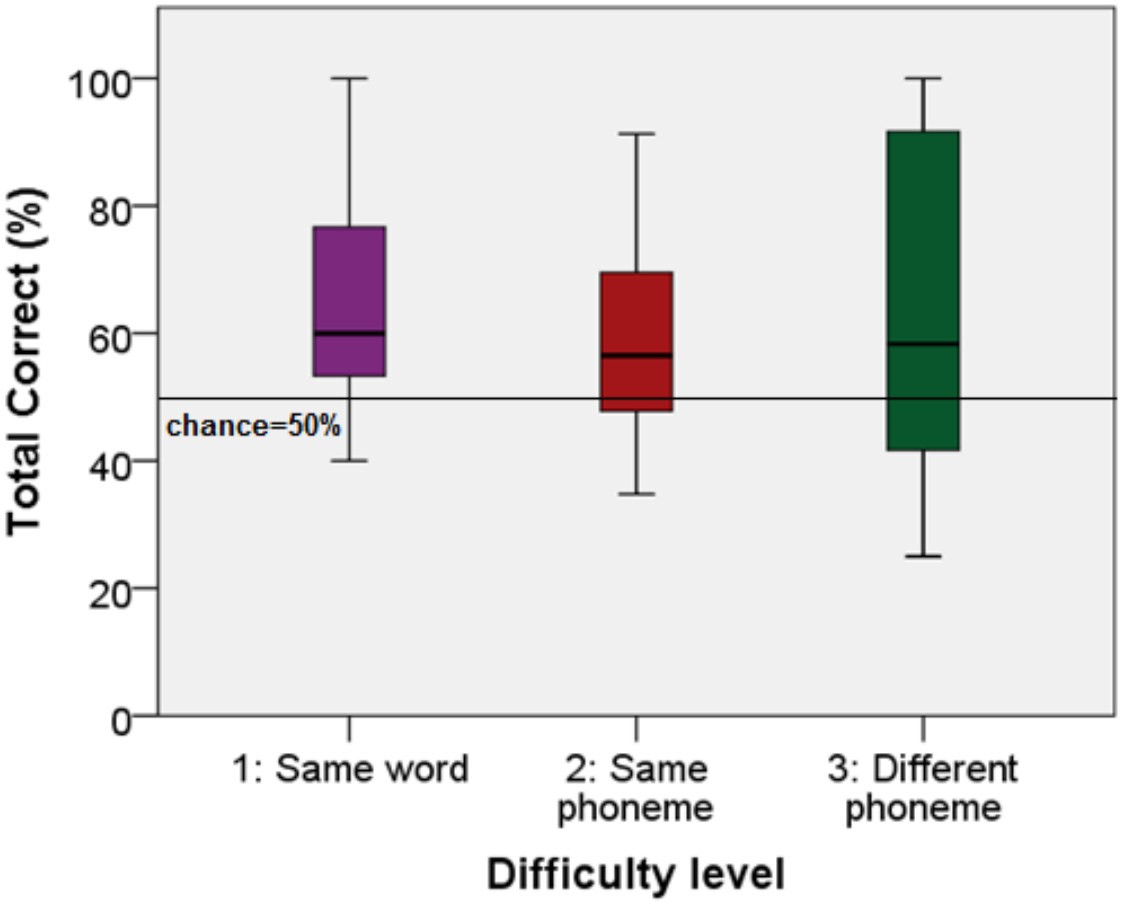
Daughters: *cake* [e:]/[eɪ]



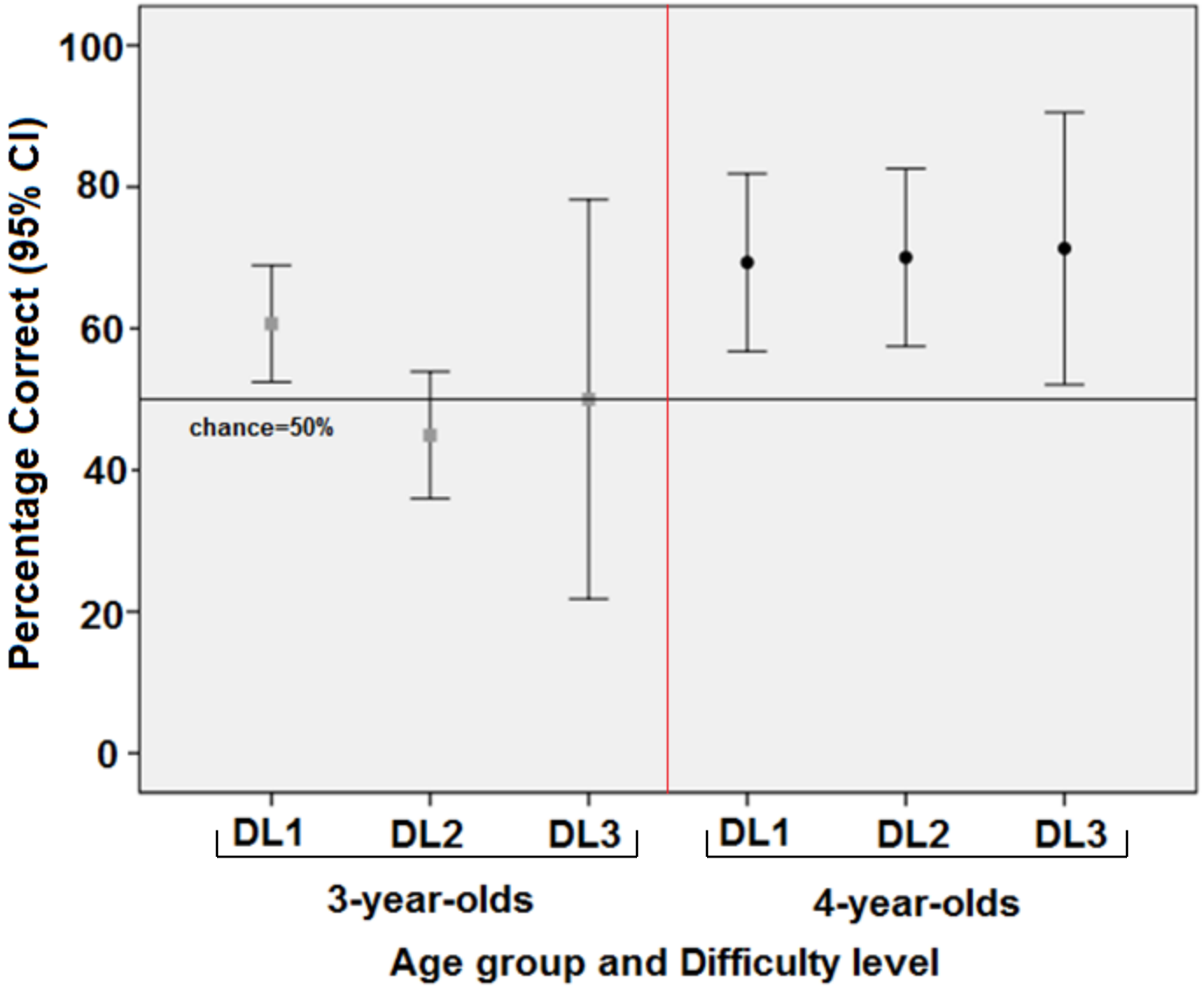
Mothers: *after* [a]/[ɑ:]

Results for each DL

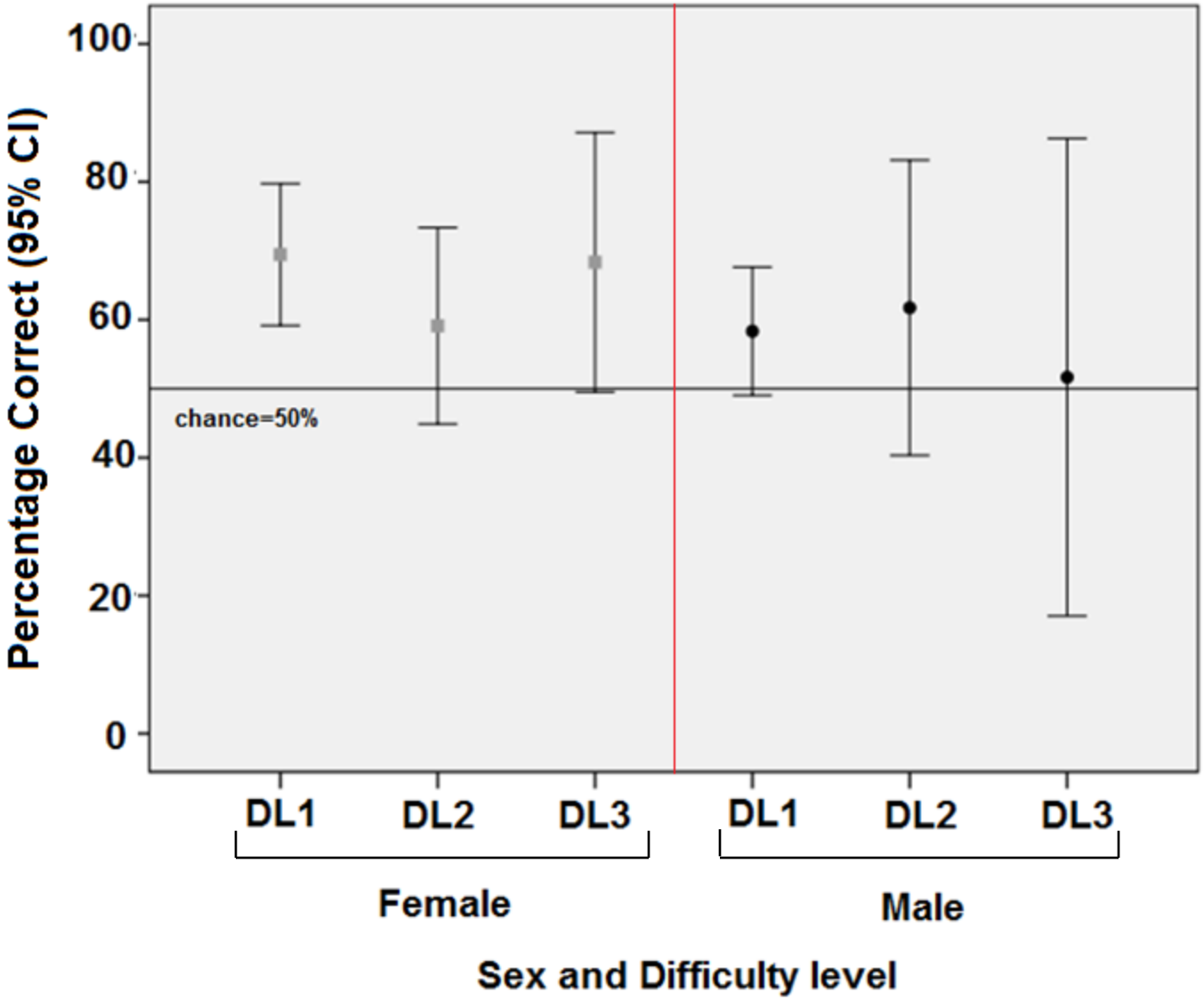
Difficulty level	Mean % correct (SD)	t-value
1	65 % (15)	4.44 (p<0.001)
2	60 % (18)	2.01 (p=0.055)
3	63 % (27)	1.83 (p=0.089)



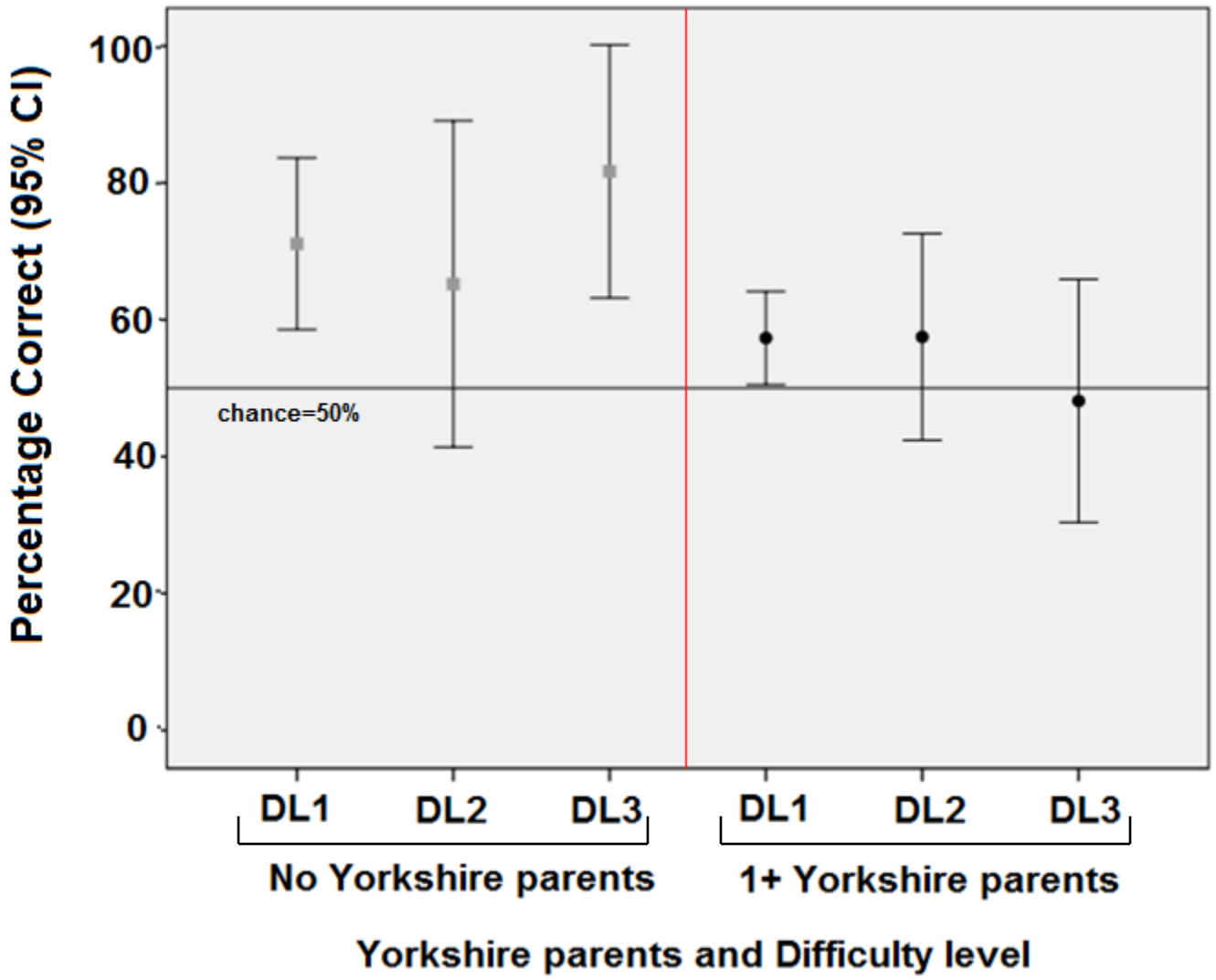
Age group and DL



Sex and DL


Percentage Correct (95% CI)
100
80
60
40
20
0
chance=50%
DL1
DL2
DL3
DL1
DL2
DL3
Female
Male
Sex and Difficulty level

Input (Yorkshire parents) and DL



Results: statistical analysis

- Stepwise backward regression method in binary, **mixed effects logistic models**, run in R
- Three binary independent variables
  - **Age:** 3 or 4
  - **Sex:** F or M
  - **Input:** 1+ Yorkshire parent or no Yorkshire parent
  - default: **3-year-old girl with no Yorkshire parent(s)**

- Two-way interactions: **Age*Sex, Age*Input**
- Random effect: individual child
- Separate models for **DL1, DL2 & DL3**

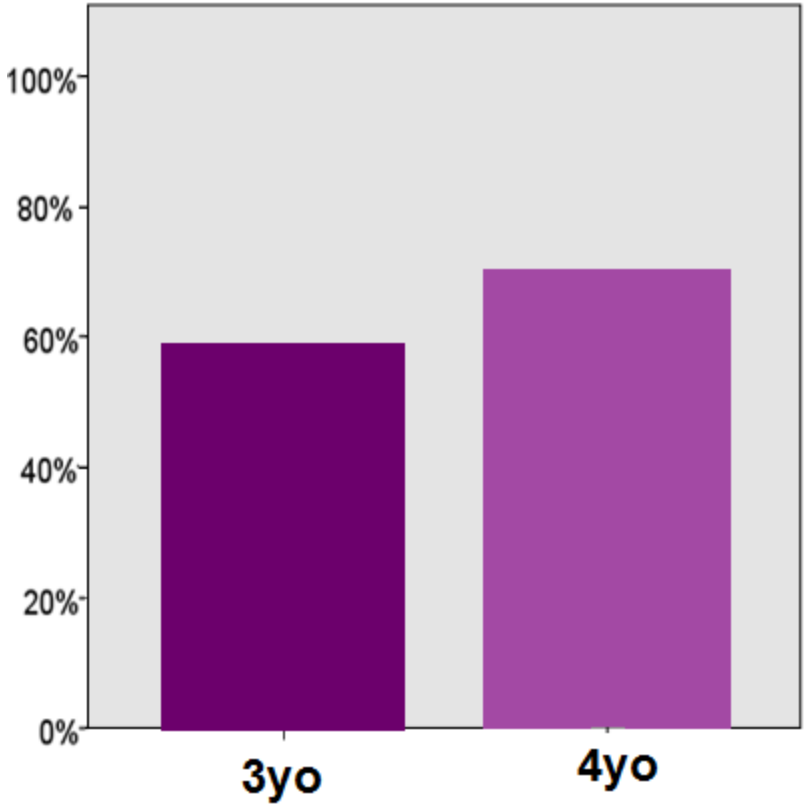
Logistic mixed effects model: Same word (DL1) results

- Two significant **main effects** – **Age, Sex**
- No significant **interactions**

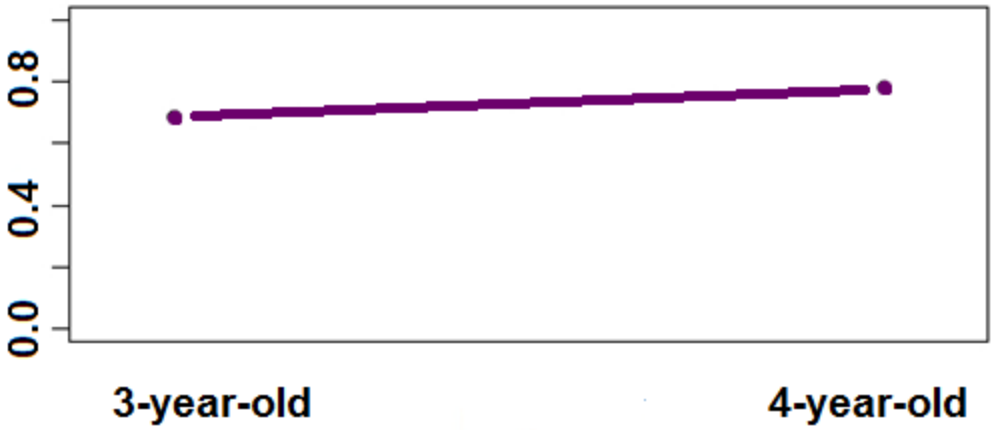
Factor	Estimate	Std. Error	z	Pr(>|z|)	Sig
(Intercept)	0.78	0.25	3.16	0.002	**
Four-Year-Old	0.52	0.27	1.94	0.05	*
Male	-0.54	0.27	-2.05	0.04	*
With Yorkshire Parent(s)	-0.43	0.25	-1.68	0.09	

Same word (DL1) results: Age

Raw data
(Total correct answers)

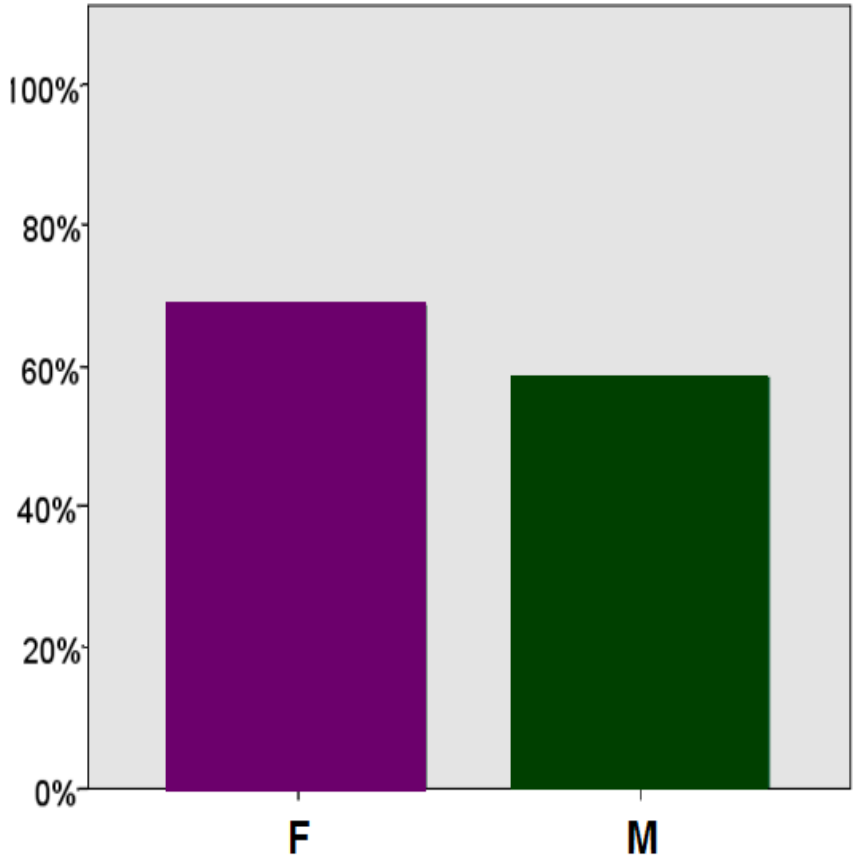


Model prediction
(Predicted probability of correct answer)

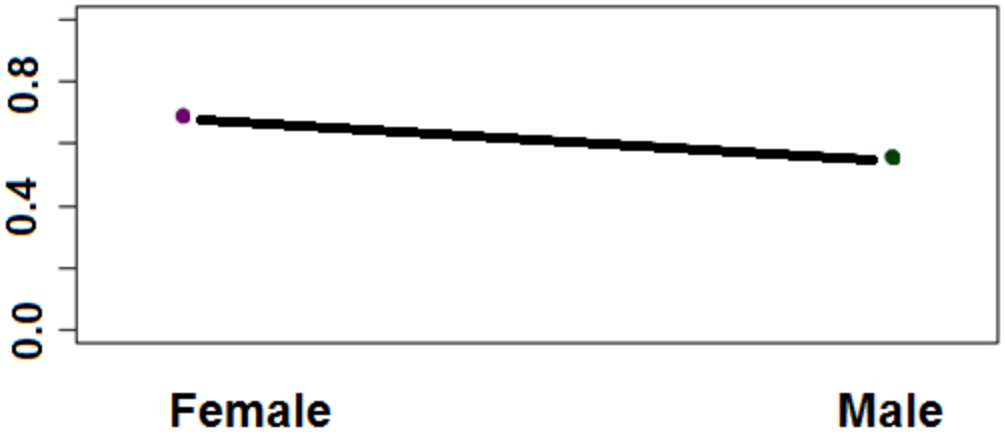


Same word (DL1) results: Sex

Raw data
(Total correct answers)



Model prediction
(Predicted probability of correct answer)



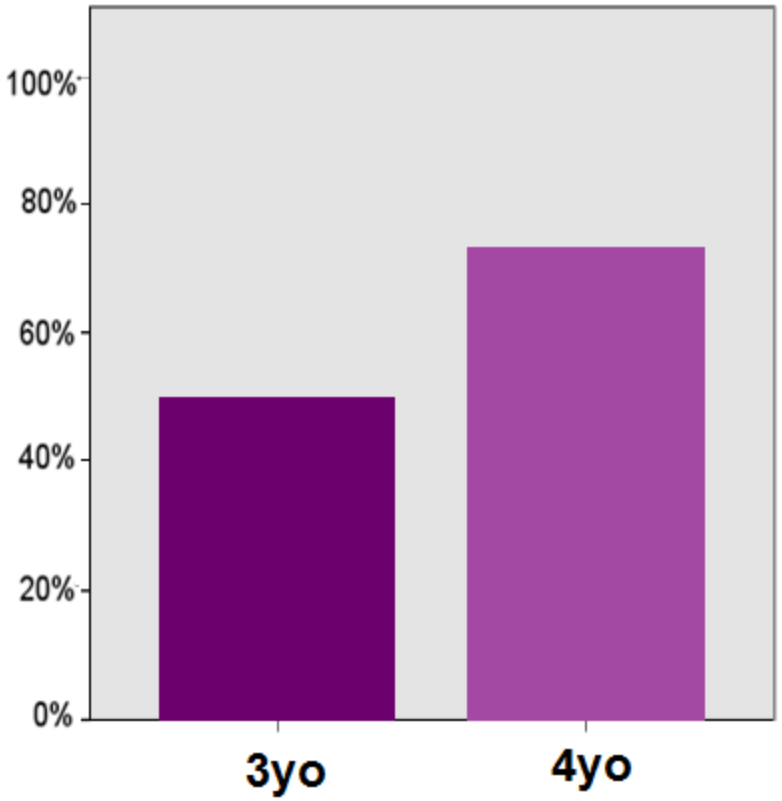
Logistic mixed effects model: Same phoneme (DL2) results

- One significant **main effect - Age**
- No significant **interactions**

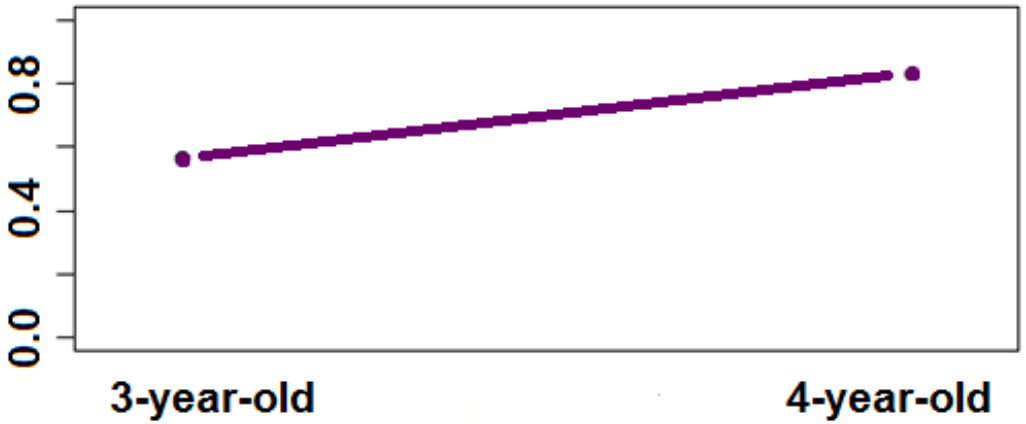
Factor	Estimate	Std. Error	z	Pr(>|z|)	Sig
(Intercept)	0.26	0.53	0.50	0.62	
Four-Year-Old	1.31	0.55	2.36	0.02	*
Male	-0.53	0.50	-1.06	0.29	
With Yorkshire Parent(s)	-0.44	0.46	-0.96	0.34	

Same phoneme (DL2) results

Raw data
(Total correct answers)



Model prediction
(Predicted probability of correct answer)



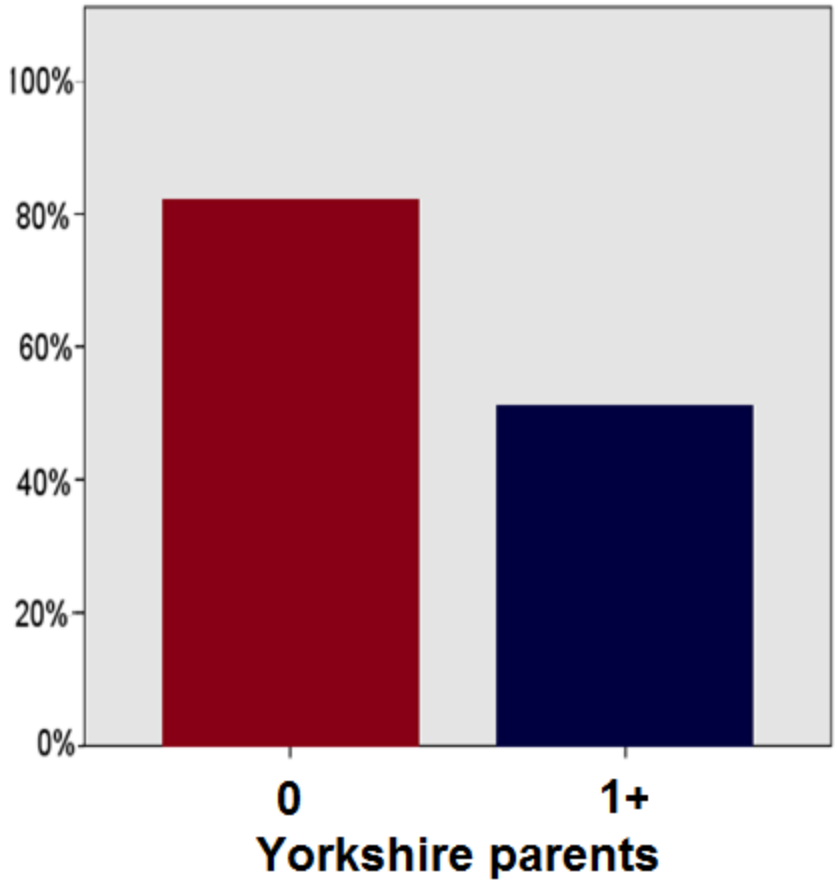
Logistic mixed effects model: Different phoneme (DL3) results

- One significant **main effect** – Yorkshire parents
- No significant **interactions**

Factor	Estimate	Std. Error	z	Pr(>|z|)	Sig
(Intercept)	1.61	0.45	3.58	0.0004	***
With Yorkshire Parent(s)	-1.6	0.54	-3.0	0.003	**

Different phoneme (DL3) results

Raw data
(Total correct answers)



Model prediction
(Predicted probability of correct answer)

Summary

- **Pre-school** children score above chance level in the ability to group together speakers based on **regionally** distributed **phonetic** variants

  - **Same word**
  - **Same phoneme**
  - **Different phoneme**

  Easier → *Harder*

- But with significant effects of **Age**, **Sex** and **Input**

Discussion: Age

- **Age improvement** between **3 and 4 years**
  - Younger age group than previously investigated
  - In line with other sociolinguistic developments and indexical learning
  - accent aids 2-4-year-olds in the recognition of familiar speakers, ability improved with age (Jeffries, in press)

- Most robust for **DL 2** (**same phoneme** condition)
  - Shows development in the understanding of a phoneme category and its variable realisations

Discussion: Sex

- **Sex: girls outperform boys**
  - Girls better at tasks requiring phonological and semantic information in long-term memory and perceptual speed

    (Sternberg 2004, Halpern 1997)

- Only significant for **DL1** (**same word** condition)
  - Boys needed longer to understand the task?
  - But also a much larger range of results for the boys in DL3 - individual variation

Discussion: Input

- **Input:** children with parents from outside of Yorkshire **perform better** in **DL3** (**different phoneme** condition)
- Exposure to speakers with **different accents** at home helps in the forming of **categories** based on **regionally** distributed **phonetic** variants
- Predicted by **Usage-based** models

  - Exposure to multiple accents generates more **robust categories**

(cf. Logan et al. 1991: multiple speakers leads to more robust categories in L2 learning)

Conclusion

- **Development** between the ages of **3 and 4** in children's ability to group speakers according to **regionally** distributed features of **pronunciation**
- **Varied input** helps in the creation of more **robust categories**
- Supports a **usage-based** model of language acquisition in which **speaker categories** are based on **experienced exemplars**

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Thanks for listening!

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Appendices

Methodology

- Positioning of mummy bears/mothers and baby bears/daughters randomised

- 8 sets of stimuli featuring [a]/[ɑː] and [e:]/ [eɪ]

  → 2 for DL1, 4 for DL2, 2 for DL3

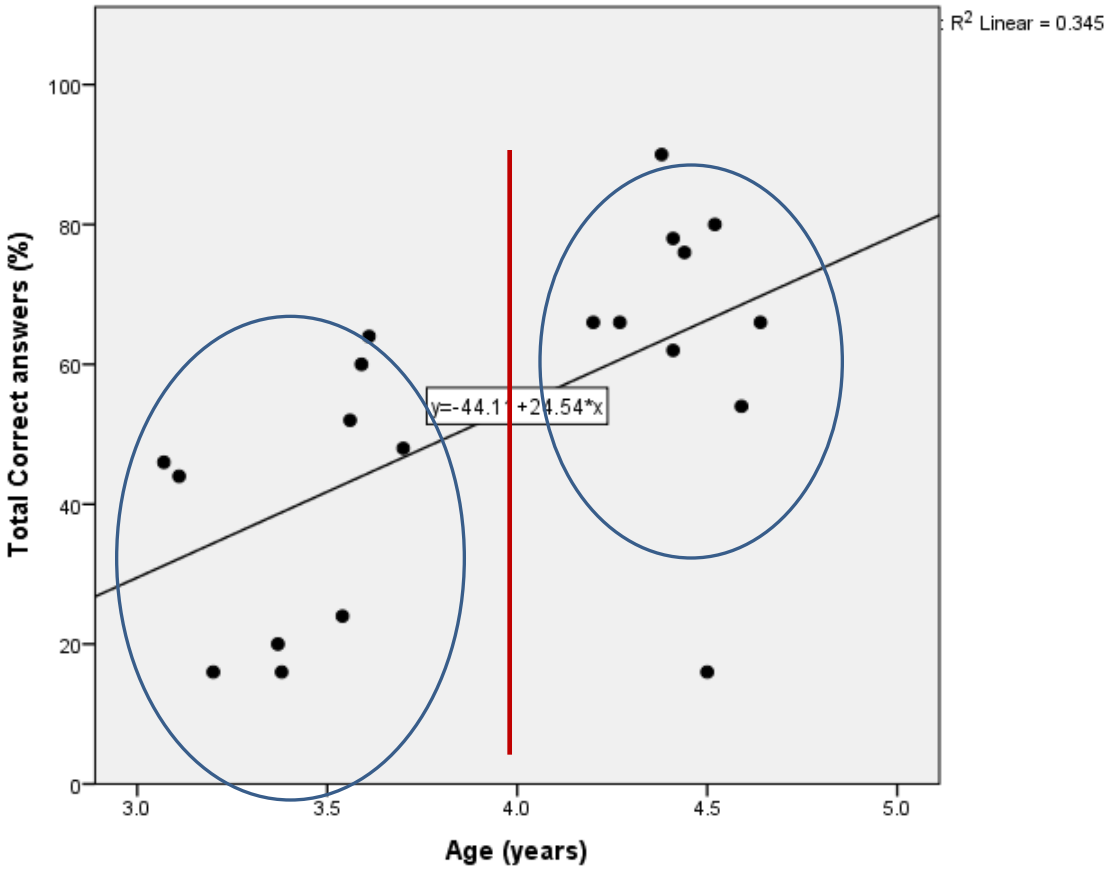
- 20 children completed DL1
- 15 children completed DL2 and DL3

Children's details

	Sex	Age	Yorkshire parents	DLs
	F	4.38	0	1, 2, 3
	F	4.41	0	1, 2, 3
	F	3.7	1	1, 2, 3
	M	3.11	1	1, 2, 3
	F	3.07	2	1, 2, 3
	F	4.52	0	1, 2, 3
	M	4.27	1	1, 2, 3
	F	3.61	1	1, 2, 3
	M	3.54	0	1
	F	3.38	1	1
	F	3.37	0	1
	F	3.59	2	1, 2, 3
	F	3.56	0	1, 2, 3
	M	3.2	0	1
	M	4.5	0	1
	F	4.44		1, 2, 3
	M	4.41	2	1, 2, 3
	F	4.64	2	1, 2, 3
	M	4.2	0	1, 2, 3
	M	4.59	1	1, 2, 3
Totals	**12 F, 7 M**	**10 4yo, 10 3yo**	**10 with YP, 9 without**	**15 all DLS, 5 just DL1**

Results

- Age divide between **3-year-olds** and **4-year-olds** for results from **all difficulty levels**



Logistic mixed effects model: All results

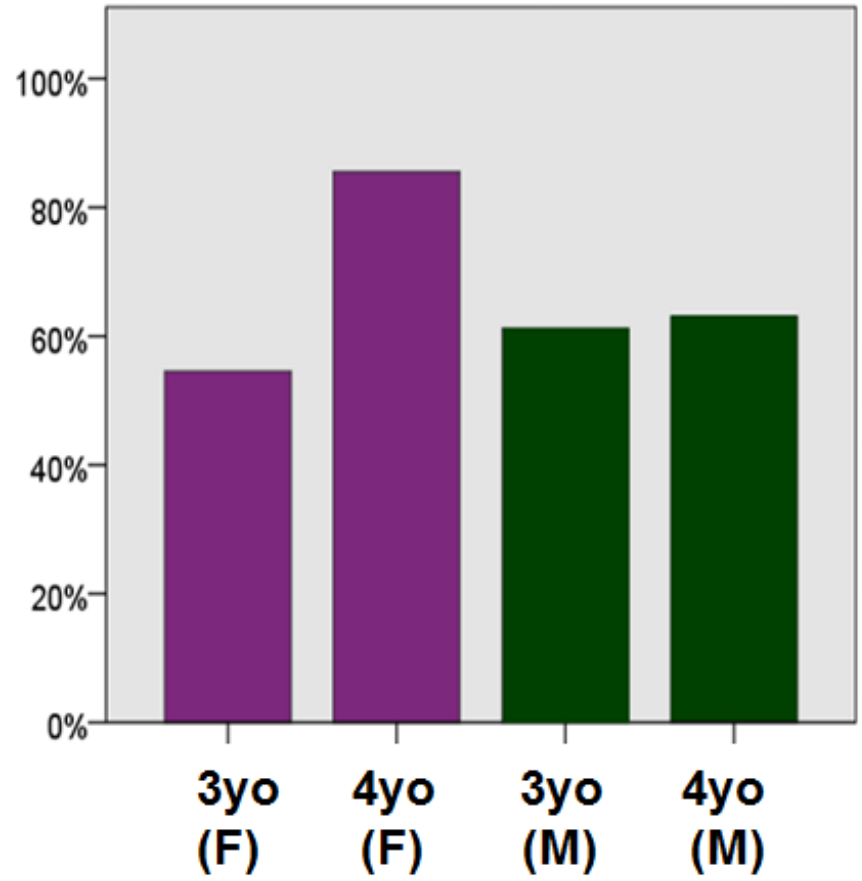
- One significant **main effect**
- One significant **interaction**

Factor	Estimate	Std. Error	z value	Pr(>|z|)	Sig
(Intercept)	0.45	0.18	2.48	0.01	*
Four-Year-Old	1.27	0.25	5.19	2.14e-07	***
Male	0.19	-0.26	0.71	0.48	
With Yorkshire Parent(s)	-0.34	0.17	-2.0	0.05	*
Four-Year-Old:Male	-1.14	0.37	-3.09	0.002	**

All results : Age & Sex

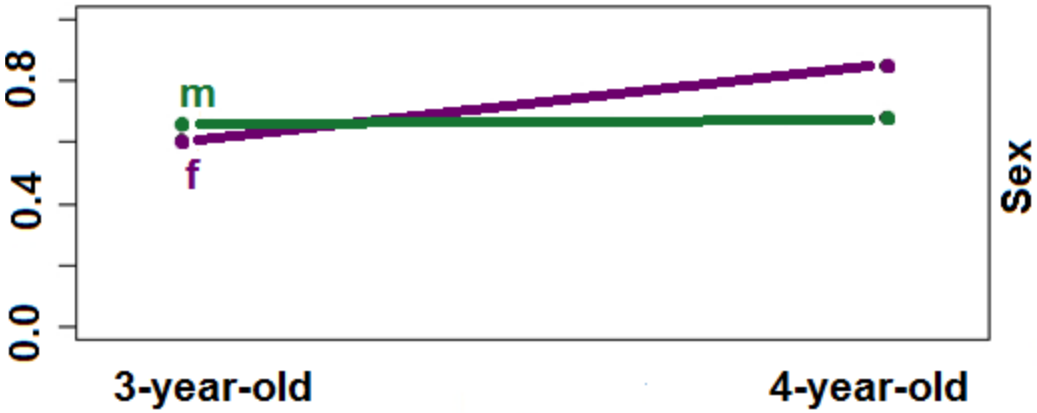
Raw data

(Total correct answers)



Model prediction

(Predicted probability of correct answer)

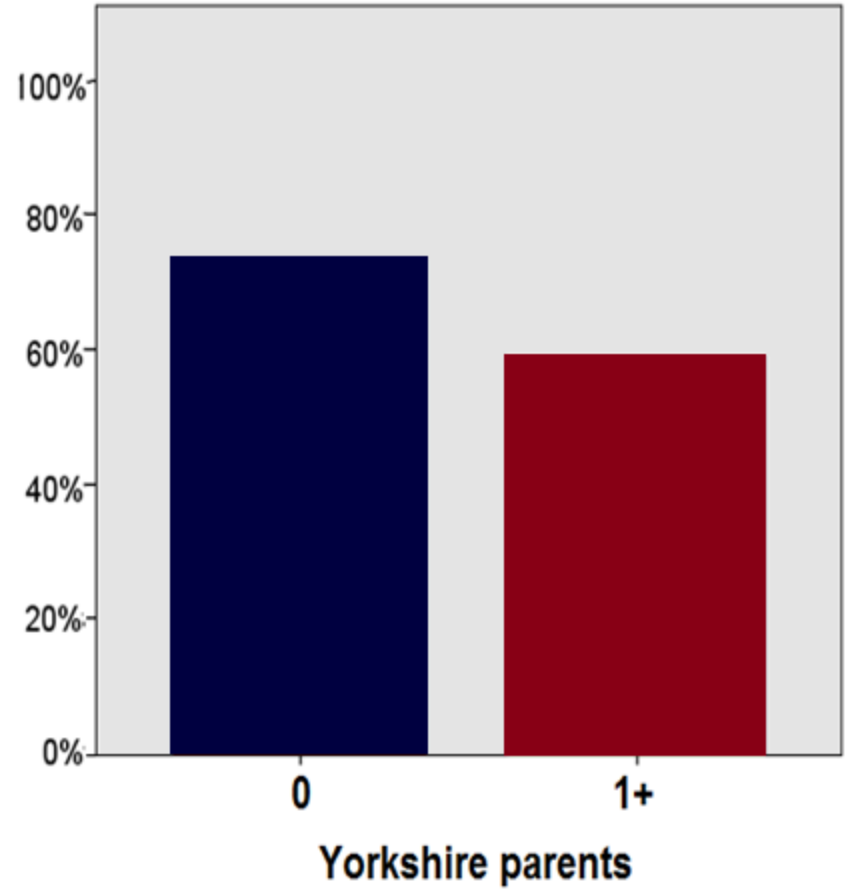


Age*Sex interaction

All results :Yorkshire parents

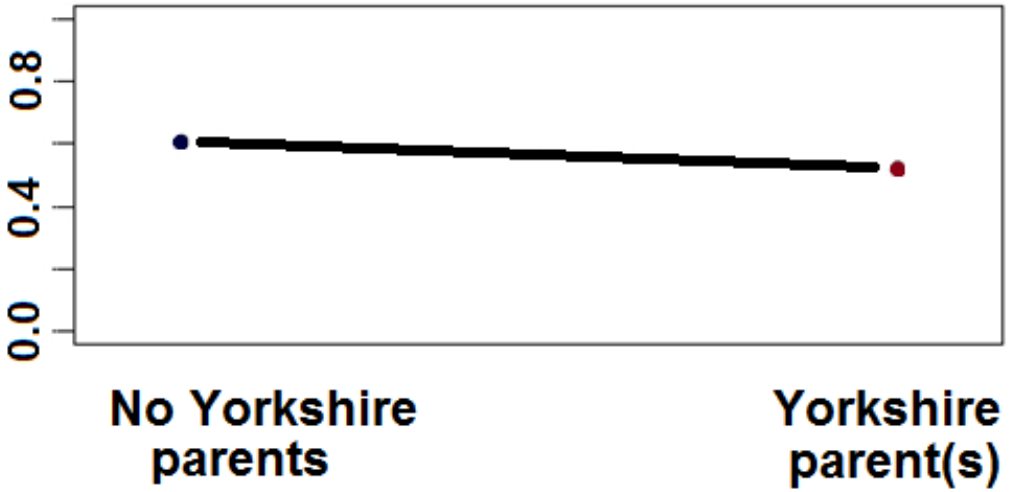
Raw data

(Total correct answers)



Model prediction

(Predicted probability of correct answer)



DL3: Southern parents

Key

- at least one Yorkshire parent
- no Yorkshire parents
- no Yorkshire parents, one Southern parent