Individual Differences in Language Acquisition: Identifying Late Talkers

Lana S. Jago, Michelle Peter, Amy Bidgood, Samantha Durrant, Julian M. Pine, & Caroline F. Rowland

Background

- There are large individual differences in early language acquisition
- A significant proportion of children are slow to begin talking: "Late Talkers"
- We know very little about why some children are slow to talk
- A large proportion of late talkers go onto develop Developmental Language Disorder while others catch up
- Understanding causes of early language delay will increase our chances in predicting later language delay
- Similarly, understanding why some children are delayed will increase our understanding of individual differences in language acquisition

Aim

The goal of the present study is to investigate if the factors which can explain individual differences in vocabulary size can also classify children who are, and are not, late to talk.

Participants

- 79 children from the ESRC LuCiD longitudinal Language 0-5 Project
- 47 girls and 32 boys
- Between 8-25 months old

Methods

- Predicting individual differences in productive vocabulary at 24 months
- Using individual differences to predict language status at 24 months
- Demographic Factor: Family Language Questionnaire
- Language: UK-CDI, Lincoln CDI, CLAN transcriptions
- Cognitive factors: Eye tracking, non-word repetition
- Environmental measure: LENA recordings

Analyses

- Regression analyses
- Sensitivity and Specificity (ROC) analyses
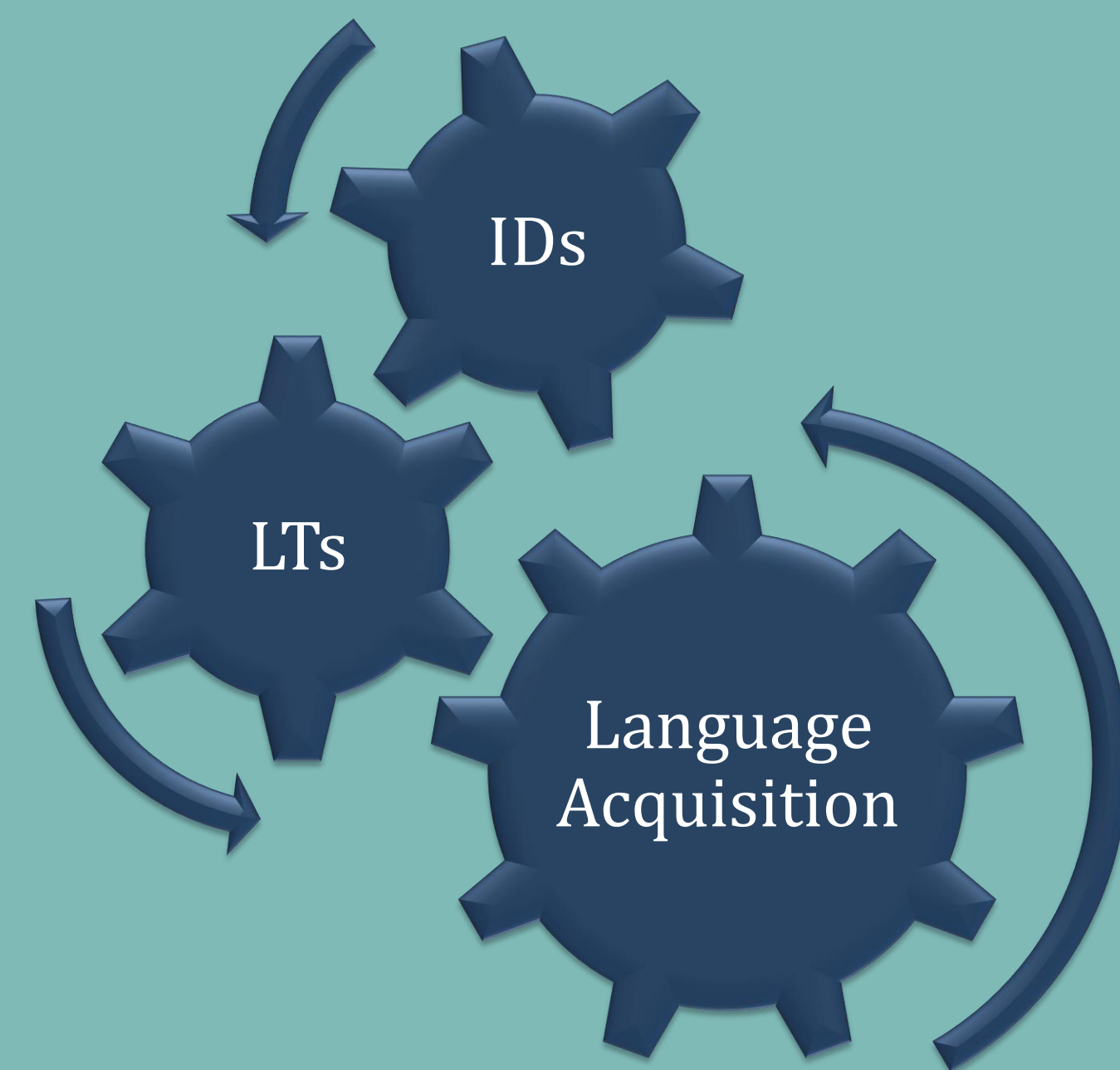- Discriminant function analyses

Table 1: Factors used to predict individual differences in productive vocabulary at 24 months. The number of participants with data available for each factor is also listed

Factors		N (girls)
Language	18 month productive vocabulary	78(40)
	18 month receptive vocabulary	78(40)
	19 month MLU	72(37)
	24M month MLU	77(40)
	24 month productive vocabulary	79 (41)
Gestures	18 month gestures	78(40)
	11 month gestures	67(34)
Cognition	19 month speed of linguistic processing	76(40)
	25 month non-word repetition	66 (35)
Input	Conversational turn count	79(41)

Results

Table 2: Results of eight separate multiple regression models. Each model contains the base model plus one additional variable

p values: *<.05 **<.01 ***<.001

Model	R^2	Adj. R^2	B	SE	t
Base Model: Sex + 18M productive vocabulary	0.49***	0.48***	1.25	0.20	6.15
Base + 18M receptive vocabulary	0.58***	0.56***	0.68	0.18	3.85
Base + 24M MLU	0.54**	0.52**	81.02	30.59	2.65
Base + 25M Non-Word Repetition	0.54***	0.52**	243.01	84.09	2.89
Base +19M Speed of Processing	0.55*	0.53*	-0.22	0.10	-2.16
Base + 18M gestures	0.51	0.48	2.66	2.06	1.29
Base + 11M gestures	0.52	0.50	1.07	2.02	0.53
Base + 19M MLU	0.52	0.50	2.95	17.21	0.17
Base + Turn Taking	0.50	0.48	0.04	0.05	0.96

Results: The base model, including sex and earlier productive vocabulary, explained 49% of the variance in productive vocabulary scores at 24 months. In addition, earlier receptive vocabulary, MLU at 24 months, non-word repetition and speed of processing all uniquely explained an additional significant proportion of the variance. Gestures, MLU at 19 months and turn taking were not unique significant predictors.

Table 3: Sensitivity and specificity ROC curve analyses for distinguishing between children who are, and are not late to talk using the variables which were significant in the regression analysis (late talkers: productive vocabulary below 25th percentile)

Variable	N(LT)	Best Cut-off	Area	SE	p	Sensitivity	Specificity
18M productive vocabulary	58(18)	< 45.5 words	.90	0.04	<.001	83%	81%
18M receptive vocabulary	58(18)	< 206 words	.81	0.06	<.001	83%	81%
24M Mean Length of Utterances	58(19)	< 1.53 morphemes	.89	0.04	<.001	90%	83%
25M Non-Word Repetition	52(13)	< 59% accuracy	.88	0.06	<.001	85%	81%
19M Speed of Processing	56(17)	< 744.79ms	.72	0.07	.006	82%	57%

Results: All five variables are successful in distinguishing late talking children from typically developing children with adequate sensitivity. However, speed of linguistic processing was less successful than the other variables at correctly classifying typically developing children with a specificity of just 57%.

Table 4: Results of discriminant analysis using different combinations of the predictor variables which were significant in the regression analysis: classification based on the best cut off scores for each of the variables in the sensitivity and specificity analyses

Variable	r	χ^2	N	df	p	Overall Accuracy	Sensitivity	Specificity
All variables (gender, 25M non word repetition, 19M speed of processing, 24M MLU, 18M receptive & productive vocabulary)	.72	36.64	59	6	<.001	93.2%	80.0%	95.9%
No experimental data (gender, 24M MLU, 18M receptive & productive vocabulary)	.78	65.58	75	5	<.001	92.0%	82.4%	94.8%
Only earlier data (19M speed of processing, 18M receptive & productive vocabulary)	.73	52.51	72	4	<.001	88.9%	87.5%	89.3%

Results: The discriminant function analysis including all of the variables correctly classified children as with or without a language delay with an overall accuracy of 93%. The standardised canonical correlation coefficients revealed 18 month receptive vocabulary contributed the most to group separation, r=.50.
Using only non-experimental factors, children with and without language delay were correctly classified with an overall accuracy of 92%. Both 18 month receptive vocabulary and 24 month MLU contributed the most to group separation, r=.55 and r=.65.
Using only the data from earlier time points, the overall accuracy for correctly classifying children was 89%. Again, earlier receptive vocabulary at 18 month contributed the most to group separation, r=.70.

Earlier Vocabulary

Mean length of utterances

Non-word repetition

Speed of Linguistic processing

Productive Vocabulary

Conclusions

- Many variables **predict individual differences in vocabulary at 2 years**
- Variables which successfully predict **individual differences** in productive vocabulary at 2 years also **distinguish** between **late talkers** and typically developing children
- Earlier productive vocabulary is the best factor for group separation

Future Directions

- Sample of late talking children
- Individual differences analysis of the data from late talking children
- Comparison of late talking children and typically developing children from the Language 0-5 Project

IDs

LTs

Language Acquisition

References

Frank, M. C., Braginsky, M., Yurovsky, D., & Marchman, V. A. (2017). Wordbank: An open repository for developmental vocabulary data. *Journal of child language*, 44(3), 677-694.
Bishop, D. V. M., Holt, G., Line, E., McDonald, D., McDonald, S., & Watt, H. (2012). Parental phonological memory contributes to prediction of outcome of late talkers from 20 months to 4 years: a longitudinal study of precursors of specific language impairment. Journal of Neurodevelopmental Disorders, 4(3), 1–12
Rescorla, L. (1989). The Language Development Survey: A Screening For Delayed Language in Toddlers. Journal of Speech and Hearing Disorders, 54, 587–599.