The Dimensionality of Language Ability in Young Children

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The Dimensionality of Language Ability in Young Children

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&

LARRC

Language and Reading Research Consortium

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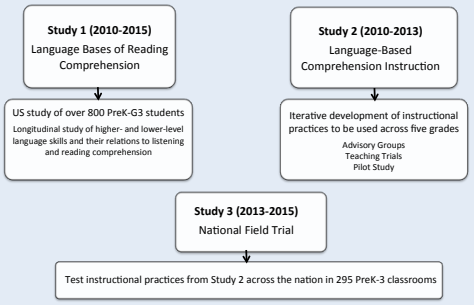
LARRC: project overview



Aims and specific research questions

- **Aim of LARRC Study 1:** to characterize the explicit contributions of different levels of language skills during early and middle childhood to individual differences in listening and reading comprehension.
- **Research question addressed in this presentation:** What is the nature of language ability among young children?

Overview

- **The dimensionality of language**
  - theoretical ways to conceptualise language
  - practical implications
- **Design and methods**
  - our measures and analysis plans
- **Results**
  - comparison of models
- **Summary and implications**

The dimensionality of language

Language is typically viewed as a complex system consisting of several components:

- phonology, syntax, morphology, semantics, and pragmatics
- expressive vs receptive
- lower vs higher-order skills

Distinctions are reflected in standardised assessments.

Language disorders typically diagnosed in two ways:

- below threshold on one subtest or the overall composite

Vocabulary and grammar

Different ways to conceptualise the relation between vocabulary and grammar:

- domain-specific systems for the lexicon and grammar (Pinker, 1997, 1998)
- interdependence of vocabulary and grammar (Bates & Goodman, 1991)

Lower- and higher-level skills

Distinction more commonly used in reading research:

- lower-level: *basic lexical & grammatical abilities*
- higher-level: *global integrative processes necessary for understanding discourse and narrative*

(Cain et al., 2004; Perfetti, 2007)

- foundational vs text-level

(Lepola et al., 2012)

Evidence: vocabulary & grammar

Evidence for uni-dimensional construct in early language development (Tomblin & Zhang, 2006):

- the factors representing vocabulary and grammar are highly correlated (*r*s > .90) for children in K, G2, & G4, but lower for children in G8 (*r* = .78).
- CFA supported a two-factor linguistic domain model for older children.
- little support for a two-factor modality model.

Tomblin and Zhang (2006) did not include higher-level skills, so we do not know if these are also part of a uni-dimensional construct in early development or separable from 'lower-level' skills.

Evidence: lower- and higher-level skills

Young language learners:

- vocabulary, sentence memory (proxy for grammar), and inference making (higher-level) each explain unique variance in concurrent listening comprehension in 6-year-olds.

(Lepola et al., 2012)

Early readers:

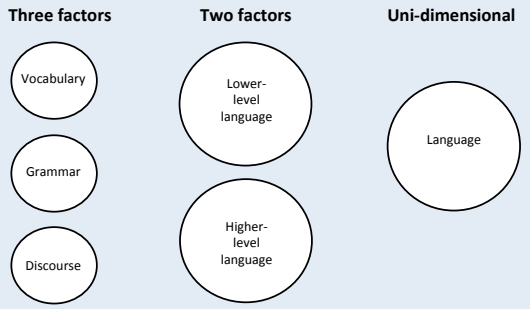
- evidence for separability; lower- & higher-level skills predict unique variance in reading outcomes.

(Oakhill & Cain, 2012)

Research question

What is the nature of language ability among young children?

Different possible models



Longitudinal study design

[For English sample; separate ELL sample]

	P	K	1	2	3
Yr 1	400	120	120	120	120
Yr 2		400	120	120	120
Yr 3			400	120	120
Yr 4				400	120
Yr 5					400
Total	400	420	640	760	880

Language measures: vocabulary

Each child completed two measures of receptive vocabulary and two of expressive vocabulary.

Grade	PPVT-R	EVT-E	CELF-R	CELF-E
Pre-K	✔	✔	✔	✔
Kindergarten	✔	✔	✔	✔
Grade 1	✔	✔	✔	✔
Grade 2	✔	✔	✔	✔
Grade 3	✔	✔	✔	✔

Language measures: grammar

Each child completed 4 - 5 measures of receptive and expressive grammar, assessing a range of knowledge.

Grade	Morph Der	TROG	CELF *word*	CELF *recall*	TEGI *past*	TEGI *3rd*
Pre-K		✔	✔	✔	✔	✔
Kindergarten		✔	✔	✔	✔	✔
Grade 1	✔	✔	✔	✔		
Grade 2	✔	✔	✔	✔		
Grade 3	✔	✔	✔	✔		

Language measures: discourse

Each child completed measures to assess 3 discourse-level skills: comprehension monitoring, inference, & knowledge of narrative structure.

Grade	CompM *KVT*	CompM *DI*	Inf *BK*	Inf *Int*	Narr *PAT*	Narr *SAT*
Pre-K	✔		✔	✔	✔	
Kindergarten	✔		✔	✔	✔	
Grade 1		✔	✔	✔	✔	
Grade 2		✔	✔	✔		✔
Grade 3		✔	✔	✔		✔

Language measures: discourse

Comprehension monitoring

Knowledge violations test: A man had three sons. The youngest was Jack. Every morning Jack chopped wood for his family. ***He always used a knife to chop the wood.*** Jack had to do it quickly on school days so he wouldn't be late for school.

Detecting inconsistencies: Last night Jill walked home through the park. ***There was no moonlight, so Jill could hardly see her way.*** Jill often takes this route home. She walked along a narrow path. ***The moon was so bright that it lit the way.*** Jill lives on the other side of the park.

Text structure

Picture arrangement test: arrange sequence of 3 to 5 pictures into a 'good story'.

Sentence arrangement test: arrange sequence of 6 to 12 sentences into a 'good story'.

Sample characteristics

Grade	Age *(years, months)*	PPVT *(standardised score)*	NV IQ *(standardised score)*
Pre-K N=416	5,01	108	102
Kindergarten N=128	6,00	110	101
Grade 1 N=125	6,11	111	106
Grade 2 N=123	8,00	108	109
Grade 3 N=122	9,01	108	109

Analysis plan

- The three (one, two, and three factor) models were run for each grade, separately.
- A range of fit indices were considered to identify the best fitting model for our data:
  - Chi-Square *(pref. ns)*
  - Comparison of adjusted (scaled) differences in X^2 test
  - RMSEA *(< .05, also p(close fit) > .05)*
  - CFI *(> .95)*
  - SRMR *(< .08)*
  - AIC *(lower is better)*

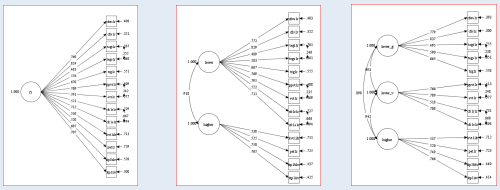
Models overview: younger children

A unidimensional structure for language was apparent for 5- and 6-year-olds (PK & K):

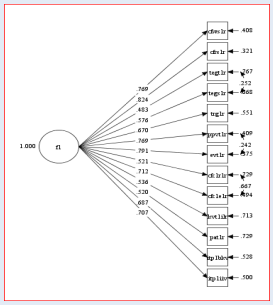
- The 1-, 2-, and 3-factor models were all good fits to the data.....
- ...but, taken together, the fit indices identified the uni-dimensional model as the best fitting model for both age groups.

Models: Pre-kindergarten (5 years)

All models had acceptable fit. Correlations between latent factors all > .85: poor discrimination. Most appropriate model for language is uni-dimensional.



Best fitting model: Pre-Kindergarten



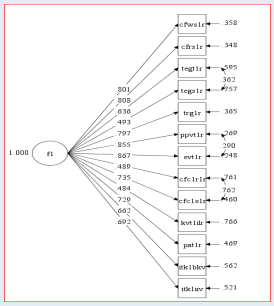
Fit indices

X^2 = 160.37, p < .001
RMSEA = .06
CFI = .96
SRMR = .04
AIC = 25663.17 (lowest of all 3 models)

Models: Kindergarten (6 years)

None of the (scaled) difference tests between models were statistically significant. Favours least restrictive uni-dimensional model.

Best fitting model: Kindergarten



Fit indices

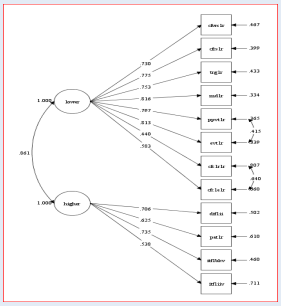
X^2 = 69.12, p = .25
RMSEA = .03
CFI = .99
SRMR = .04
AIC = 7727.15 (lowest of all 3 models)

Models overview: for Grades 1 - 3

With increasing age, a multidimensional structure emerged:

- For Grades 1 & 2, the 2-factor model was a better fit than the 1-factor model and there was no difference between the 2- and 3-factor models.
- By Grade 3, the 3-factor model was the better fit.

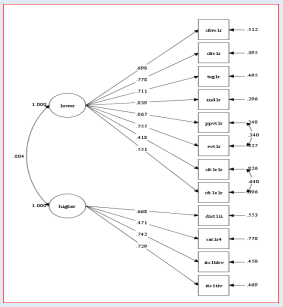
Best fitting model: Grade 1 (7 years)



Fit indices

X^2 = 64.61, p = .10
RMSEA = .05, p > .05
CFI = .98
SRMR = .05
AIC = 6855.41 (lowest of all 3 models)

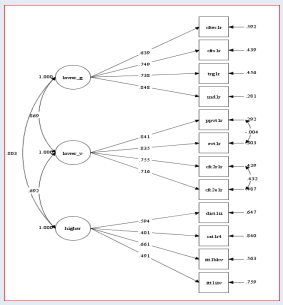
Best fitting model: Grade 2 (8 years)



Fit indices

X^2 = 75.32, p = .02
RMSEA = .06, p > .05
CFI = .97
SRMR = .05
AIC = 6379.63 (lowest of all 3 models)

Best fitting model: Grade 3 (9 years)



Fit indices

X^2 = 67.03, p = .05
RMSEA = .05, p > .05
CFI = .97
SRMR = .06
AIC = 6262.03 (lowest of all 3 models)

Summary

Our data support Tomblin & Zhang's (2006) identification of a uni-dimensional structure for language in 5- and 6-year-olds.

Our data fundamentally extend that work by showing:

- that higher-level language skills, when included, form part of a uni-dimensional construct at 5 & 6 years
- clear evidence of a multi-dimensional structure of language emerging after 6 years :
  - two factors emerge at 7 years; three factors by 9 years

Final thoughts & implications

Why are separate factors apparent in older children?

- older children are more likely to have adequate specific vocabulary to perform syntactic and higher-order tasks?
- syntax and morphology are emergent dimensions?

(Bates & Goodman, 1991; Tomblin & Zhang, 2006)

If language is uni-dimensional (at least for younger children) why do we find subtypes? (e.g., Conti-Ramsden & Botting, 1999)

Final thoughts & implications

Why are separate factors apparent in older children?

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(Bates & Goodman, 1991; Tomblin & Zhang, 2006)

If language is uni-dimensional (at least for younger children) why do we find subtypes? (e.g., Conti-Ramsden & Botting, 1999)**... but can the decrease in association between dimensions explain instability of subtypes over time?** (e.g., Tomblin & Zhang, 2006)

Final thoughts & implications

Does uni-dimensionality mean that we should just measure one aspect of language, not many?

- not necessarily....
  - the measures of different 'domains' all contributed to the latent factor.
  - and best prediction of reading comprehension evident when vocabulary, grammar, and discourse-level skills included (National Early Literacy Panel, 2008).

Thank you

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