



Relationship between Metalinguistic Awareness, Nonverbal Problem-Solving, and Language Skills of 3- to 8-year-old Children



UNIVERSITY OF MINNESOTA

Lizbeth H. Finestack & Katherine J. Bangert
Department of Speech-Language-Hearing Sciences, University of Minnesota
finestack@umn.edu/www.finestackclil.com

Introduction

- Metalinguistic awareness is the ability to think about and reflect on language (Bialystok, 1986).
- Research involving bilingual children suggests that metalinguistic skills are closely related to cognitive and language skills, such that children with strong metalinguistic abilities tend to be children with strong cognitive and language skills (Bialystok, 1988).
- Relatively little is known about the development of metalinguistic skills in monolingual children and how it relates to a child's cognitive and language skills.
- Increased knowledge of metalinguistic development is important to better understand the co-development of cognitive and language skills and potentially to improve how language is taught to children with language-learning weaknesses.

Research Questions

- Do the metalinguistic awareness skills of 3- through 8-year-old monolingual children with typical development vary by age?
- What is the relationship between metalinguistic awareness, cognitive abilities, and language abilities of typically developing children and do these relationships differ by age?

Method

- At the 2014, 2015, and 2016 Minnesota State Fairs, we recruited monolingual typically-developing children aged 3- through 8-years and their parents to complete our assessment battery.
- Of approximately 750 participants who completed the study, 460 met study inclusionary criteria:
 - Monolingual
 - No history of developmental disability or hearing loss
 - Average or above average cognitive and language abilities
- Parents completed a questionnaire regarding their child's development and demographic information and the Behavior Rating Inventory of Executive Functioning (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000).
- Children completed the Matrices subtest of the Kaufman Brief Intelligence Test, Second Edition (KBIT-2; Kaufman & Kaufman, 2004), the Recalling Sentences subtest of the Clinical Evaluation of Language Fundamentals, and a metalinguistic awareness probe.
- The metalinguistic probe comprised tasks used by other researchers to evaluate vocabulary and morphology metalinguistic skills (Berko, 1958; Bialystok, 1986; Chaney, 1992; Piaget, 1929).

Participants

Characteristic	AGE GROUP						
	3 n = 66	4 n = 63	5 n = 89	6 n = 91	7 n = 97	8 n = 56	
Age (yr)	Mean SD	5.52 0.31	4.51 0.30	5.46 0.30	6.46 0.29	7.47 0.29	8.41 0.33
Gender	Male:Female	33:33	28:35	46:43	47:44	46:51	22:34
Race	White:Other	58:8	55:8	78:9	77:13	82:15	47:8
Income	< \$50k \$50-\$100k > \$100k	9 22 34	9 25 24	8 33 42	7 35 44	7 27 59	2 18 33
KBIT-2 Nonverbal IQ (SS: mean = 100, SD = 15; 3 yo raw based on raw scores)							
	Mean SD Min-Max	9.43 4.38 0-18	103.37 11.74 80-127	101.62 11.85 81-138	101.87 13.32 81-141	106.24 11.70 82-132	112.02 12.47 80-141
CELF-4 Recalling Sentences (SS: mean = 10, SD = 3)							
	Mean SD Min-Max	11.28 3.03 7-18	11.64 2.67 7-19	11.47 2.52 7-18	11.17 2.60 7-19	11.64 2.43 7-17	11.24 2.74 7-18
BRIEF-4 Inhibit (T-score)							
	Mean SD Min-Max	46.05 8.75 34-70	46.80 8.65 36-70	49.58 8.47 36-69	49.00 9.21 36-68	46.42 6.83 36-65	46.47 8.06 37-69
BRIEF-4 Shifting (T-score)							
	Mean SD Min-Max	46.41 7.08 37-65	47.57 8.17 38-70	47.54 7.74 37-67	47.00 8.31 37-70	47.77 8.84 37-68	45.43 8.33 36-68

Tasks



Task 1: Word Manipulation

- My friend and I are making up a new language. Could this be a gok? Yes it could. What is this?
- Can you eat a gok?
- Do goks have wheels?



Task 2: Word Swap

- Suppose that everyone in the world agreed that from now on we will call the sun the moon and the moon will be called the sun. All we are going to do is change the names.
- What would this be? (moon)
- What will the sky look like when you see this? (blue)



Task 3: Wug Task

- I am going to show you some pictures and say some sentences. Sometimes a word will be missing. I want you to tell me the missing word.
- This is a wug
- Now there is another one. There are two of them. There are two _____.



Task 4: Grammatical Judgment

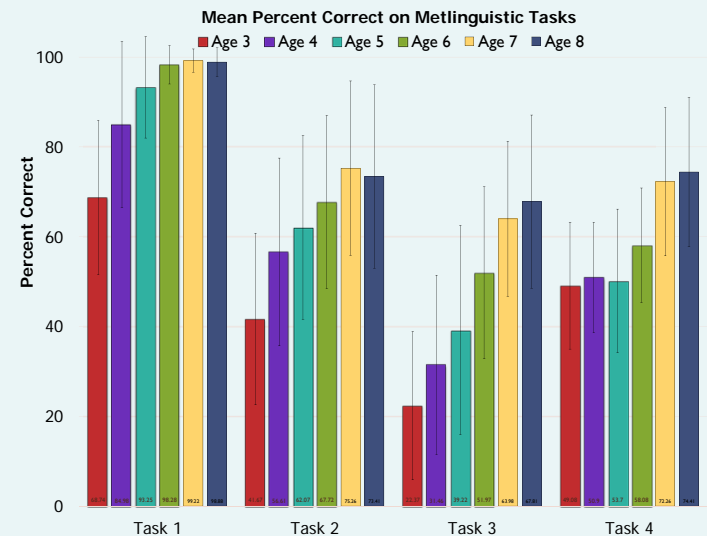
- Wobo is a creature from outer space. Sometimes she says things the wrong way. Sometimes she says things that are silly. You need to tell her when she says a sentence the wrong way.
- Apples grow on noses.
- I have two pencil.

Results

1. Do metalinguistic awareness skills vary by age?

- Based on ANOVA statistical tests:

Task 1	Task 2	Task 3	Task 4
• Ages 3, 4, & 5 < Ages 6, 7, & 8; $\rho < .01$	• Age 3 < Ages 4, 5, 6, 7, & 8; $\rho < .01$ • Age 4 < Ages 6, 7, & 8; $\rho < .01$ • Age 5 < Ages 7 & 8; $\rho < .01$ • Age 6 < Age 7; $\rho = .01$	• No sig difference between Ages 7 & 8 • All other comparisons sig with $\rho < .02$	• Ages 3, 4, & 5 < Ages 6, 7, & 8; $\rho < .01$ • Age 6 < Ages 7 & 8; $\rho < .01$



2. What is the relationship between metalinguistic awareness, cognitive abilities, and language abilities?

Correlations between metalinguistic task performance and cognitive, language, and behavior skills				
	Task 1	Task 2	Task 3	Task 4
Nonverbal IQ (raw)	.53* $\rho < .01$	.40* $\rho < .01$	.59* $\rho < .01$	.50* $\rho < .01$
Recalling Sentences (raw)	.56* $\rho < .01$	.46* $\rho < .01$	.68* $\rho < .01$	.55* $\rho < .01$
Inhibition (T)	.04 $\rho = .46$	.06 $\rho = .21$	-.01 $\rho = .90$	-.04 $\rho = .40$
Shifting (T)	.02 $\rho = .64$	.04 $\rho = .37$	.08 $\rho = .10$	.05 $\rho = .37$

Significant correlations between metalinguistic task performance and cognitive, language, and behavior skills by age									
	Task 1		Task 2		Task 3		Task 4		
Nonverbal IQ (raw)	3 yo	5 yo	7 yo	3 yo	5 yo	7 yo	3 yo	5 yo	7 yo
	4 yo	6 yo	8 yo	4 yo	6 yo	8 yo	4 yo	6 yo	8 yo
Recalling Sentences (raw)	3 yo	5 yo	7 yo	3 yo	5 yo	7 yo	3 yo	5 yo	7 yo
	4 yo	6 yo	8 yo	4 yo	6 yo	8 yo	4 yo	6 yo	8 yo

Conclusions

- Performance on metalinguistic tasks varies by age. Generally, performance improved with age, but there was variability in trends across tasks.
 - Task 1: Ages 7 & 8 performed near ceiling
 - Task 4: Ages 3, 4, & 5 performance no better than chance
- Collapsed across age groups, cognitive and language skills were strongly related to metalinguistic skills. However, these relationships varied by age and task.
 - Task 1: strong correlations for younger children
 - Task 3: strong correlations for older children
- Parent reported executive function skills of inhibition and shifting were not closely related to metalinguistic performance. Direct assessments of children's executive function skills may be more sensitive and should be examined in future work.

Many thanks to the children and families who participated in this study. The authors have no financial or nonfinancial relationships to disclose.