Problem Solving Performance in Children with SLI:
Does it Depend on Processing Capacity?

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Abstract

Do children with Specific Language Impairment use different problem-solving strategies from their typically developing peers? Does processing capacity play a role in these differences? If strategy use depends on processing capacity, then children with SLI should use less mature strategies than age and IQ-matched peers, but they should perform similarly to younger peers matched for capacity. We investigated these ideas in a study of children's abilities to determine "what comes next" in pattern completion problems. Data from 36 children were included in a group-wise comparison between children with SLI and age-matched peers. Data from 38 children were included in a group-wise comparison between children with SLI and younger, processing-capacity-matched children. Children with SLI were less likely to use an advanced problem-solving strategy than their age and IQ-matched peers, but their performance did not differ from children matched for processing capacity. Thus, differences in strategy use between children with SLI and age-matched peers may be due, at least in part, to differences in processing capacity.

Introduction

Do children with Specific Language Impairment use different problem-solving strategies from their typically developing peers? If so, might processing capacity play a role in these differences? If children with SLI have smaller processing capacity than their age peers, and if more mature strategies require greater processing capacity, then children with SLI should use less mature strategies than their age peers. However, they should perform similarly to younger peers matched for capacity.

We investigated these ideas in a study of children's abilities to determine "what comes next" in pattern completion problems, such as the following:

●■..●■..●__

To test our hypotheses, we compared a group of 18 children with SLI to a group of 18 peers who were matched on age and IQ, and we compared a group of 19 children with SLI to a group of 19 younger peers who were matched on processing capacity as measured on the Competing Language Processing Test.

Hypotheses

❑ When matched on **age and nonverbal IQ** scores, children with SLI will perform less well than the typically developing children.

❑ When matched on **processing capacity**, children with SLI will perform similarly to the typically developing children.

❑ These trends will be reflected both in **nonverbal responses** and **verbal explanations** given for these solutions.

Method

Participants. All children participated in a previous recent study (M = 5.4 months previously) during which scores for nonverbal IQ, expressive and receptive language scores (all three used for an SLI/typical classification), and scores on the Competing Language Processing Task (CLPT) were obtained.

	Age in Yrs;Mos (Mean, SD)	Nonverbal IQ (Mean, SD)	CLPT words recalled (Mean, SD)
Processing Capacity Matches (N = 38)	SLI: 10;6, 1;10 TYP: 7;5, 1;4	SLI: 95.9, 6.4 TYP: 104.3, 6.7	**SLI: 36.2, 15** **TYP: 36.8, 16.1**
Age & Nonverbal IQ Matches (N = 36)	**SLI: 10;3, 1;1** **TYP: 10;0, 1;7**	**SLI: 97.3, 5.8** **TYP: 98.8, 5.6**	SLI: 37, 12.6 TYP: 52, 19.5

Stimuli. Each of the 24 trials was a pattern that had two sub-patterns embedded within it. One sub-pattern involved size (big/small) and one involved shape (circle/square). Sub-patterns varied in period length (2 or 3) and in pattern type (AABAAB, ABAABA, ABBABB, ABABAB). Each pattern fell into one of three categories: (1) period and pattern type for the two sub-patterns were the same (Same-Same), (2) period for the two was the same, but pattern type was different (Same-Different), or (3) both period and pattern type were different (Different-Different).

Same-Same (SS)	Same-Different (SD)	Different-Different (DD)
Shape: AABAABA	Shape: ABAABAA	Shape: AABAABA
Size: AABAABA	Size: ABBABBA	Size: ABABABA
● ● ■ . . ● ■ . __	● ■ . ● ■ . ● __	● ● ■ . ● ● ● __

Coding

Nonverbal Responses: Nonverbal responses were coded online based on children's choices for each of the patterns (● ● ■ ■). Children simply pointed to the shape that they thought should come next in the pattern.
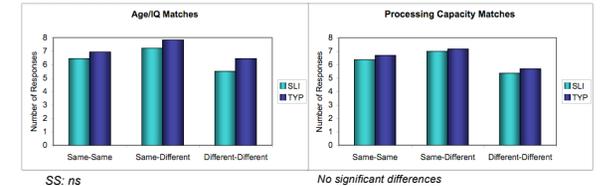
Verbal Explanations: Verbal explanations were videotaped and later transcribed and coded. Coding was based on the verbal and gestural information children expressed when explaining their choices. Children could use more than one strategy for each trial.

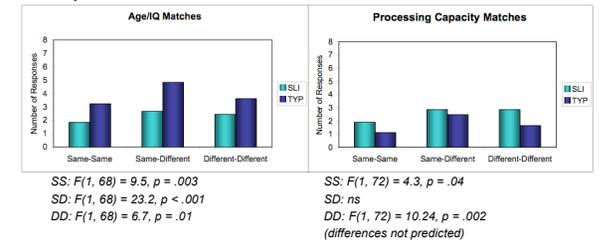| Strategy Type	Example
One Dimension (only one dimension, shape or size, is mentioned)	"I got it because it goes circle circle square circle circle square circle then square"
Both Dimensions (mentions both shape and size)	"The pattern goes big square little circle, big square little square little circle, big square then little square"
Pattern Relations (mentions how the shapes relate to each other in the pattern)	"Because after every two circles there's always a square, and it ends with a circle, so a square must come next"
Don't Know/Guess (Does not give any specific information about the pattern)	"I don't know" or "I just guessed on this one"

Results

*We examined the **number of responses that incorporated both shape and size** in solving the pattern.*

Nonverbal Choices:

SS: ns
SD: F(1, 68) = 2.8, ns (p = .10)
DD: F(1,68) = 6.7, p = .01

No significant differences

Verbal Explanations:

SS: F(1, 68) = 9.5, p = .003
SD: F(1, 68) = 23.2, p < .001
DD: F(1, 68) = 6.7, p = .01

SS: F(1, 72) = 4.3, p = .04
SD: ns
DD: F(1, 72) = 10.24, p = .002
(differences not predicted)

Discussion

The pattern of results suggests that differences between children with SLI and their age-matched peers in problem-solving strategies are due, at least in part, to differences in processing capacity. Further, this pattern is manifested both in nonverbal choices and verbal explanations.

The fact that children with SLI were *more* likely to provide sophisticated verbal explanations than their younger, processing-capacity-matched peers is noteworthy. This finding suggests that other factors besides processing capacity affect children's verbal explanations. Such factors presumably include age and experience with patterns.

Acknowledgements