

# **Language, Reading, and Processing Rate Difficulties in Children With a Positive Family History of Language Impairments**

**Judy F. Flax, Teresa Realpe, Linda Hirsch,  
Jason Nawyn, Paula Tallal**

*Center for Molecular and Behavioral Neuroscience  
Rutgers University, Newark, NJ*

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## **Abstract**

**A family aggregation study design was used to investigate the rate of co-morbidity for language impairment (LI), reading impairment (RI), and auditory rate processing impairment (ARPI). Subjects were either siblings or extended family members (cousins) of a child (proband) identified as meeting the diagnostic criteria for specific language impairment (SLI). All subjects completed a battery of language, reading, and auditory rate processing tests and were classified based on this test battery.**

**Results revealed a very high degree of co-morbidity of impairment across all three of these diagnostic classifications for probands as well as their siblings. Only 15.3% of those children who met criteria for LI were LI alone; 84.7% of those also met criteria for RI and/or ARPI. When looking only at those children who met criteria for RI, only 15.8% met criteria for RI alone. The other 84.2% also met criteria for LI and/or ARPI. Finally, when looking only at those children who met criteria for ARPI, 31% had only a rate processing problem. The remaining 69% also met criteria for LI and/or RI. These data suggest that language impairments are rarely specific or confined to oral language functions, but rather generally co-occur with reading and/or auditory rate processing deficits.**

# Introduction

Over the past twenty years, a series of studies using both behavioral and genetic methods has lent strong support to the notion that both specific language impairment (SLI) and dyslexia aggregate in families (Brzustowicz, 1996; Gopnik and Crago, 1991; Lahey and Edwards, 1995; Rice, Haney, and Wexler, 1998; Scarborough, 1989, Tallal, Ross, and Curtis, 1989; Tomblin, 1989). Furthermore, longitudinal research indicates that children who demonstrate language problems during the preschool years are at an increased risk for both language and reading problems as they get older (Catts, 1993; Rissman, Curtis, and Tallal, 1990; Scarborough, 1990). Even in individuals where oral language difficulties appear to resolve, language problems are often replaced by reading and general learning difficulties that are language-based .

There is evidence that many, but not all, individuals with difficulties in higher level phonological processing, necessary for the development of both language and reading, also demonstrate concomitant difficulties in processing dynamic (rapidly changing) sensory information specifically in the tens of milliseconds time.

The goal of the present study is to investigate further the interrelations among language, reading, and rapid auditory processing in children with SLI and their primary and extended child relatives.

# Subject Selection

## Specific Language Impaired (SLI) Probands

**41 subjects who meet the following criteria:**

- **Performance IQ 80**
- **Spoken Language Quotient 85**  
*or* **mean of SLQ and Token Test\* 85**
- **No evidence of: hearing loss, general cognitive deficit, paralysis of oral motor musculature, neurological, or psychiatric disorder**

## Breakdown of Participants

		<b>Probands</b>	<b>Siblings</b>	<b>Cousins</b>
<b>Male</b>	<b>Number</b>	<b>32</b>	<b>46</b>	<b>42</b>
	<b>Median Age</b>	<b>8-3</b>	<b>9-3</b>	<b>8-7</b>
	<b>Age Range</b>	<b>4-2 to 19-2</b>	<b>3-1 to 19-8</b>	<b>3-5 to 20-0</b>
<b>Female</b>	<b>Number</b>	<b>9</b>	<b>45</b>	<b>26</b>
	<b>Median Age</b>	<b>7-2</b>	<b>10-4</b>	<b>11-0</b>
	<b>Age Range</b>	<b>4-11 to 9-5</b>	<b>4-1 to 19-11</b>	<b>2-5 to 19-6</b>
<b>Total Number</b>		<b>41</b>	<b>91</b>	<b>68</b>

## Procedures

As part of a larger study of the genetic basis of language-learning impairments in families, each child received a neuropsychological battery of standardized and experimental tasks including the areas of cognition, language, reading, and auditory rate processing. For this portion of the study, impairment criteria were as follows:

### Language Impaired (LI)

#### Test of Language Development

(TOLD:2 Primary, TOLD: 2 Intermediate, TOAL 2)

- Spoken Language Quotient 85  
*or* mean of SLQ and Token Test\* 85

### Reading Impaired (RI)

#### Woodcock Reading Mastery Tests-Revised, 1987

- Word Attack (non-word reading) SS 85  
*or* Word ID (single-word reading) SS 85

### Auditory Rate Processing Impairment (ARPI)

#### Tallal Repetition Test - Auditory Rate Processing subtest

- Percent Correct 60

\* Token Test for Children (DiSimoni, 1978) has a mean of 500 and a standard deviation of 5. Scores were converted to z-scores and then scored on a scale of 100 with a standard deviation of 15. Tomblin (1992) administered an adapted version of the Token Test for Adults (DeRenzi and Faglioni) to 70 adults; 35 who had been diagnosed as language impaired and 35 whose language development appeared normal. Within each of these two groups of adults, scores on the Token Test expressed as percent correct were normally distributed. When the distribution of scores for the two groups were compared, it was found that one standard deviation below the mean of the normal group corresponded to one standard deviation above the mean for the language impaired group, thus indicating that this test is clearly able to distinguish between language impaired and normal adults. This information was used to translate scores on the Token Test from the current study, expressed as percent correct, into standard scores with a mean of 85 and a standard deviation of 15.

## Results

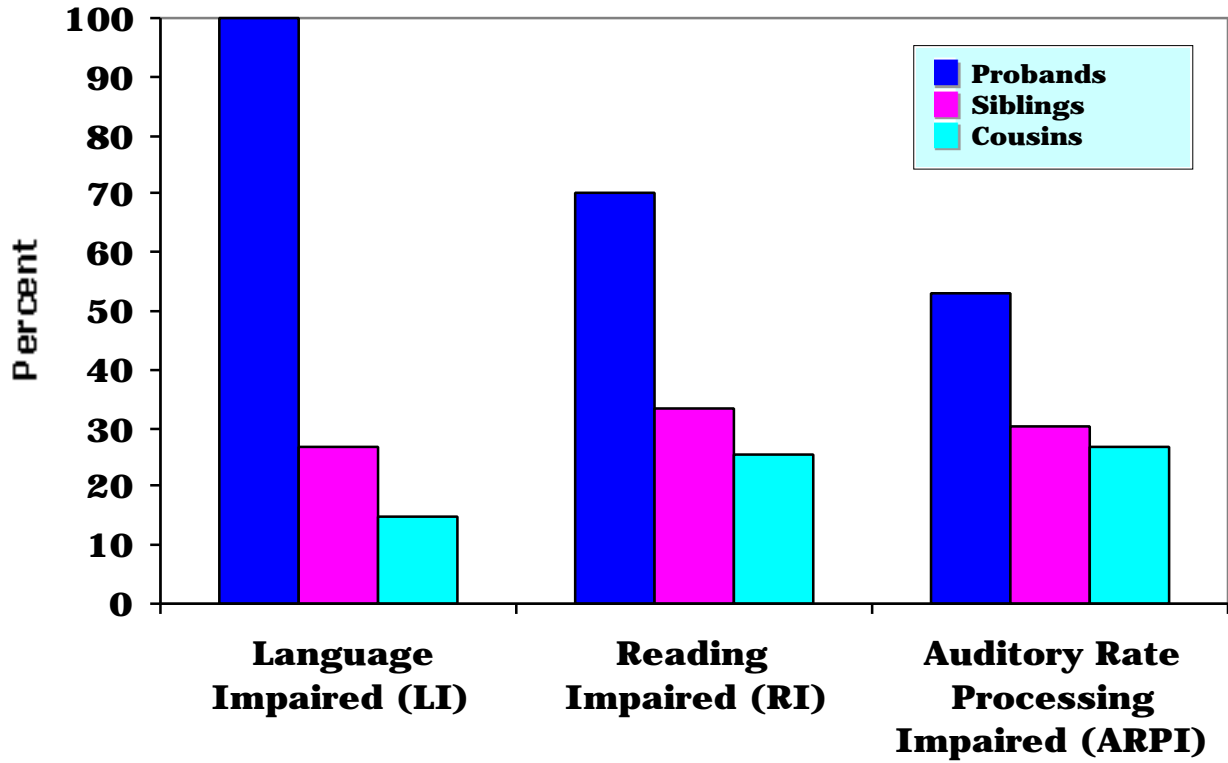
When children who come from a positive family history for SLI have a language impairment, they are more likely to have a reading and/or auditory rate processing impairment than those who do not have a language impairment ( $\chi^2 = 56.5$ ,  $p < 0.0001$ ).

Only **15.3%** of the children diagnosed as having a language impairment had a language impairment alone. The other **84.7%** had a reading and/or auditory rate processing impairment.

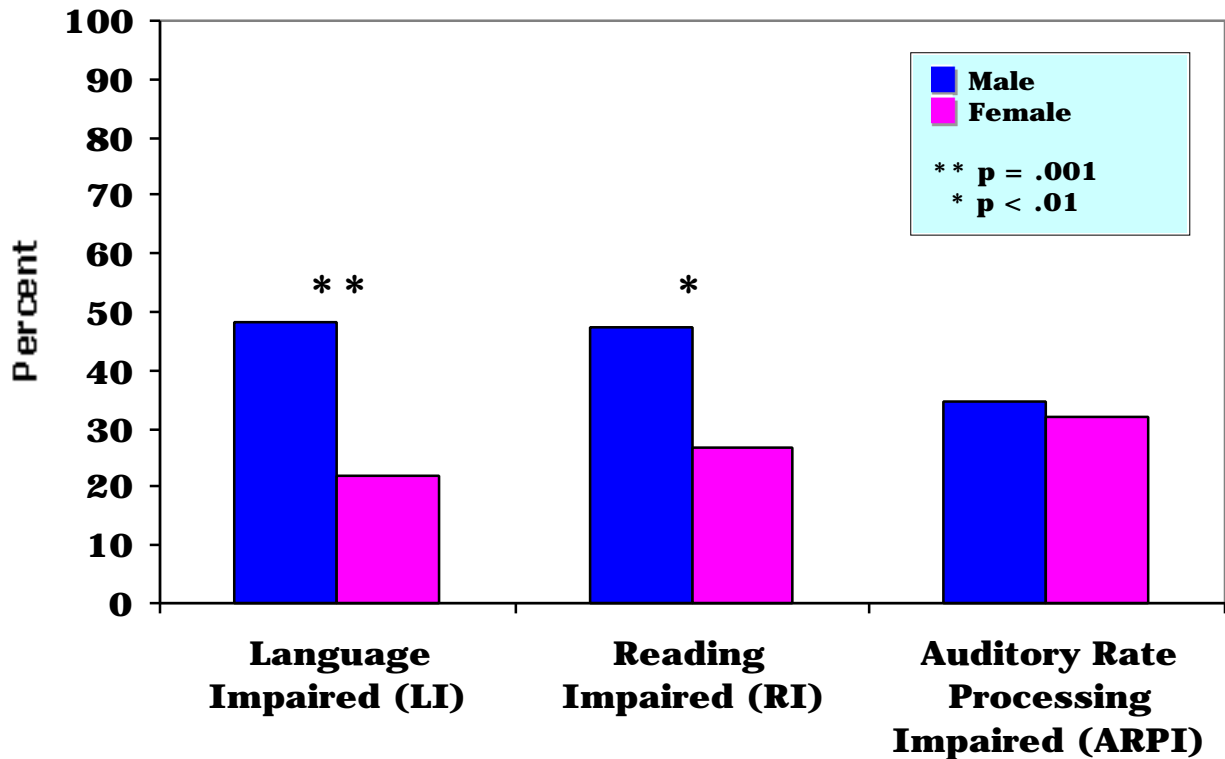
Only **15.8%** of the children diagnosed as having a reading impairment had a reading impairment alone. The other **84.2%** had a language and/or auditory rate processing impairment.

Only **31%** of the children had an auditory rate processing impairment alone. The other **69%** had a language and/or reading impairment.

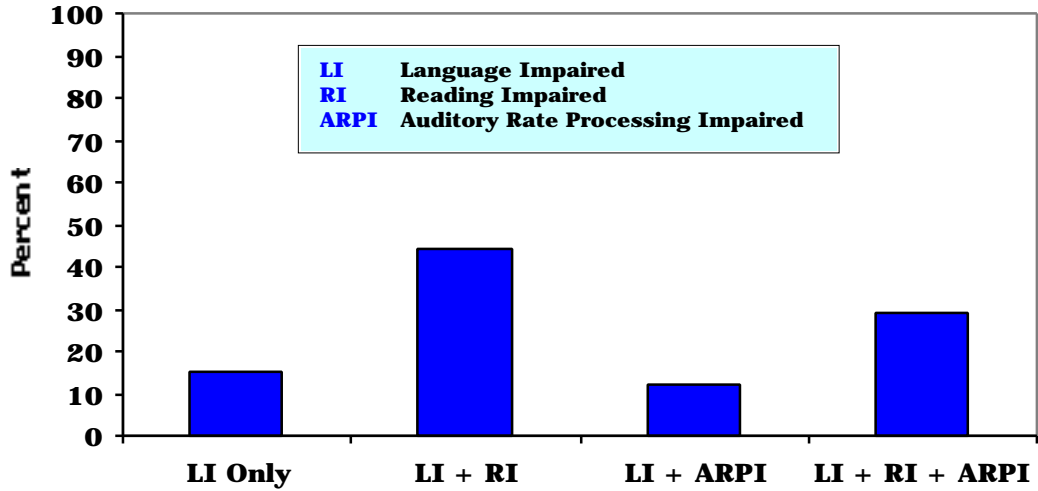
## Rates of Impairment in SLI Probands, Siblings & Cousins



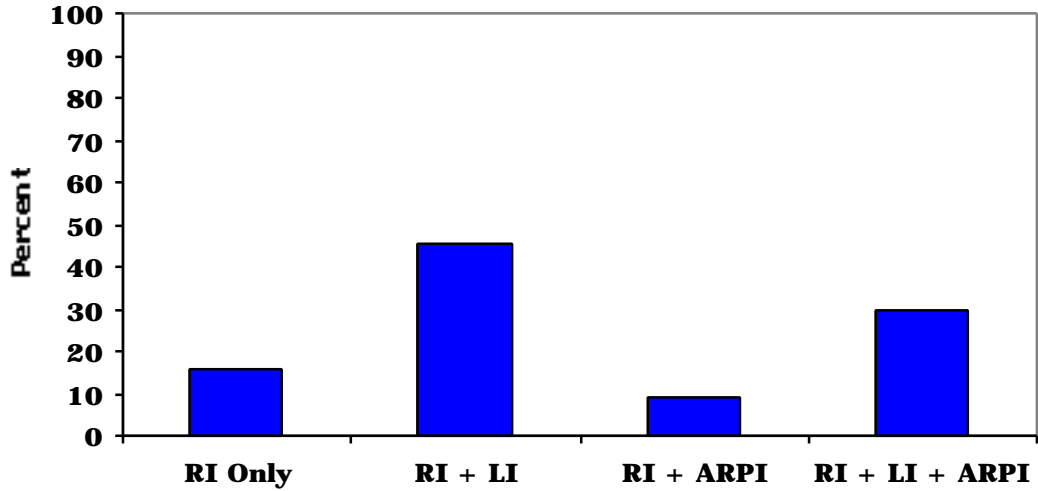
## Rates of Impairment by Gender



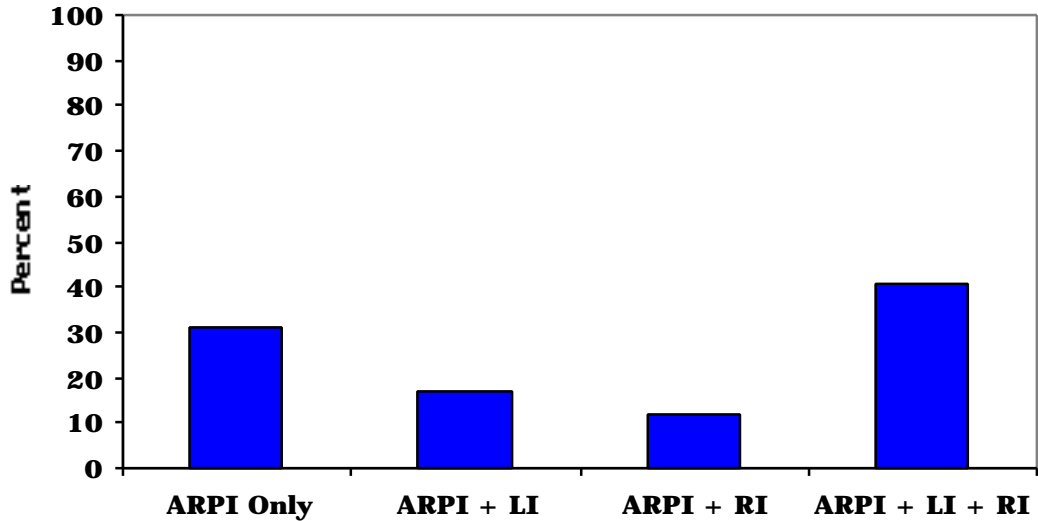
### Co-morbidity in children who met criteria for LI



### Co-morbidity in children who met criteria for RI



### Co-morbidity in children who met criteria for ARPI



## **Interpretation**

**These data support the idea that Specific Language Impairment (SLI) rarely appears in isolation. Rather, language, reading, and auditory rate processing impairments tend to co-exist in individuals with a positive family history for SLI.**

## **Educational Implications**

**A child who has no current overt speech or language problems may have a history of speech, language and processing problems during the preschool years putting them at greater risk for academic and reading problems (Scarborough, 1989).**

**A child who is having difficulty learning to read, may have a language-based learning disability. The inability to process the rapidly successive acoustic cues of speech may compromise the development of phonological decoding and awareness skills.**

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