Relationship of Language Subtypes and Literacy Skills in Families with a History of SLI

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Conference Poster
American Speech, Language and Hearing Association
November 16, 2000
Washington, D.C.

Introduction

There is evidence that general language ability is highly related to reading ability (Bowey and Patel, 1988; Wagner, Torgesen, Laughon, Simmons & Rashotte, 1993). Specific Language Impairment (SLI) has been viewed as a dynamically changing impairment over time, often leading to reading impairment. Reading impairment is viewed as a developmental language-based disorder that manifests itself differently at different stages of development (Catts, 1991; Conti-Ramsden & Botting, 1999). Preschool children with delayed language development generally present with phonological, syntactic and/or morphological issues. School-aged children struggling to learn to read are characterized by difficulties in reading decoding and other phonological awareness tasks. Adults with a history of oral and/or written language deficits continue to have difficulties in higher-level metalinguistic tasks (Hohnen & Stevenson, 1999), as well as with some low-level auditory and visual processes (Talcott, et al. 2000).

Early language abilities have been used to predict reading and academic achievement in longitudinal studies (Catts, 1993; Rissman, Curtiss & Tallal, 1990; Scarborough, 1990), with several studies identifying phonological awareness as the most important predictor of later reading abilities (Scarborough, 1998; Wagner, Torgesen & Rashotte, 1994). Furthermore, both language and reading impairments are known to aggregate in families (Gilger, Pennington & DeFries, 1991; Rice, Haney & Wexler, 1998; Tallal, Ross & Curtiss, 1989; Tallal, Hirsch, Realpe-Bonilla, Miller, Brzustowicz & Flax, submitted; Tomblin, 1989) and in many family members these problems co-occur (Flax, Realpe, Hirsch & Tallal, 1999). Gender differences in both language and reading impairments also have been reported in these families (Lewis, 1992; Tomblin, 1989; Tomblin and Buckwalter, 1994).

Despite these consistent finding of family aggregation and co-morbidity of Language Impairment (LI) and Reading Impairment (RI), the precise mechanisms by which language development interacts with the development of reading are not well understood. Although it is generally accepted that oral language ability may constrain reading ability, little is known about which specific aspects or components of oral language may relate to which specific components of reading. The purpose of this study is to investigate in more detail the relationship between specific patterns of oral and written language deficits within and between family members participating in a family/genetic study.

Aim

This study examines the relations among specific oral language (subtypes) and specific reading skills. Participants included children with SLI along with their nuclear and extended family members. Based on previous research we would predict:

1. There will be a high correlation between some language subtypes and some specific reading skills.
2. There may be differences in patterns of correlation found in children versus adults.
3. There may be gender differences in the correlations between language subtypes and specific reading skills since gender differences have been reported in both language and reading abilities.

Methods

Table 1: Participants

	Male	Female	TOTAL
Probands	**27**	**9**	**36**
Parents	**35**	**36**	**71**
Siblings	**42**	**38**	**80**
Extended Family	**38**	**39**	**77**
			n = 264

Table 2: Measures used to Assess Language and Reading

ORAL LANGUAGE **Various Assessments**	**READING** **Woodcock Mastery Tests-Revised**
Test of Language Development-Primary (TOLD-P:2) (Hammill, et al., 1987) Test of Language Development-Intermediate (TOLD-I:2) (Hammill & Newcomer, 1988) Test of Adolescent Language (TOAL-2) (Newcomer & Hammill, 1988) Test of Auditory Analysis Skills (TAAS) (Rosner, 1979)	Word Identification (Real word reading) (Woodcock, 1987) Word Attack (Nonsense word reading) (Woodcock, 1987) Passage Comprehension (Reading comprehension) (Woodcock, 1987)

Table 3: Breakdown of Language Measures into Language Subtypes

	Receptive Language	Expressive Language	Grammar	Phonol. Awareness
TOLD-P:2	Picture Vocabulary Grammatic Understanding	Oral Vocabulary Sentence Imitation Grammatic Completion	Grammatic Understanding Sentence Imitation Grammatic Completion	TAAS
TOLD-I:2	Vocabulary Grammatic Comprehension Malapropisms	Sentence Combining Word Ordering Generals	Sentence Combining Word Ordering Grammatic Comprehension	TAAS
TOAL-2	Listening Vocabulary Listening Grammar	Spoken Vocabulary Speaking Grammar	Listening Grammar Speaking Grammar	TAAS

Procedures

All subjects received the age-appropriate language and reading measures.

Subtest standard scores (ss) for **each language subtype** (mean=10, SD=3) were converted into a composite standard score using the following formula:

$$\frac{Sum\ of\ subtest\ standard\ scores}{\#\ of\ subtests\ in\ subtype} = subtype\ composite\ ss$$

Example: Told P:2 Receptive Language Subtype:

$$\frac{(Picture\ Vocabulary\ ss\ +\ Grammatic\ understanding\ ss)}{2} = receptive\ language\ subtype\ composite\ ss$$

A fourth oral language domain, **Phonological Awareness** was derived using the Test of Auditory Analysis Skills (TAAS, Rosner, 1979), a phonological deletion task.

Family members were divided into two groups based on age and language test received:

- **Children** - those who received the TOLD P:2 or TOLD I:2
  (4 yrs., 0 mos. to 12 yrs.,5 mos.)
- **Adults** - those who received the TOAL-2
  (≥12 yrs., 6 mos.)

Analysis

Pearson Correlation Coefficients were performed to investigate the relationship among language and reading skills. T-tests were used to determine whether there were any significant gender differences represented in these correlations.

The following questions were addressed specifically during the analysis phase:

1. Are there relationships among language subtypes and specific reading skills?
2. Do patterns of correlations for grammar differ across ages?
3. Are there any significant gender-specific differences in these relationships?

Results

QUESTION 1: Are there relationships among language subtypes and specific reading skills?

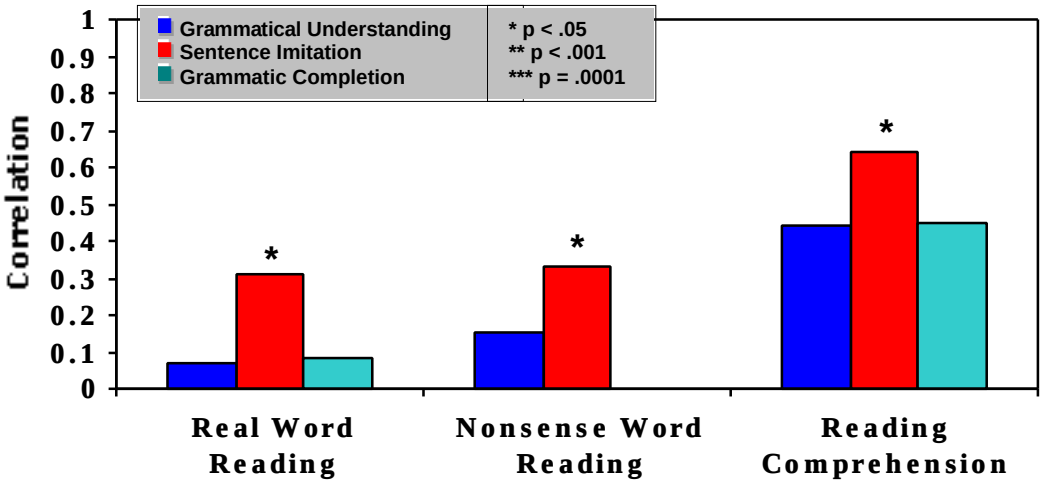
	Receptive Language		Expressive Language		Grammar		Phonological Awareness	
	Child	Adult	Child	Adult	Child	Adult	Child	Adult
Real Word Reading	.40***	.69***	.55***	.71***	.50***	.66***	.36	.34**
Nonsense Word Reading	.40***	.65***	.46***	.68***	.47***	.66***	.55**	.37**
Reading comprehension	.67***	.73***	.73***	.76***	.76***	.70***	.22	.30**

* p < .05
** p < .01
*** p ≤ .0001

Result: All language subtypes and reading skills are significantly correlated in adults. In children, all reading measures are highly significantly correlated with oral language subtypes except for phonological awareness, which is only significantly correlated with nonsense word reading. In most cases, specific correlations were higher for adults for children. The most notable exception was the correlation between phonological awareness and nonsense word reading, which was higher for children than adults.

QUESTION 2: Do patterns of correlations for grammar differ across ages?

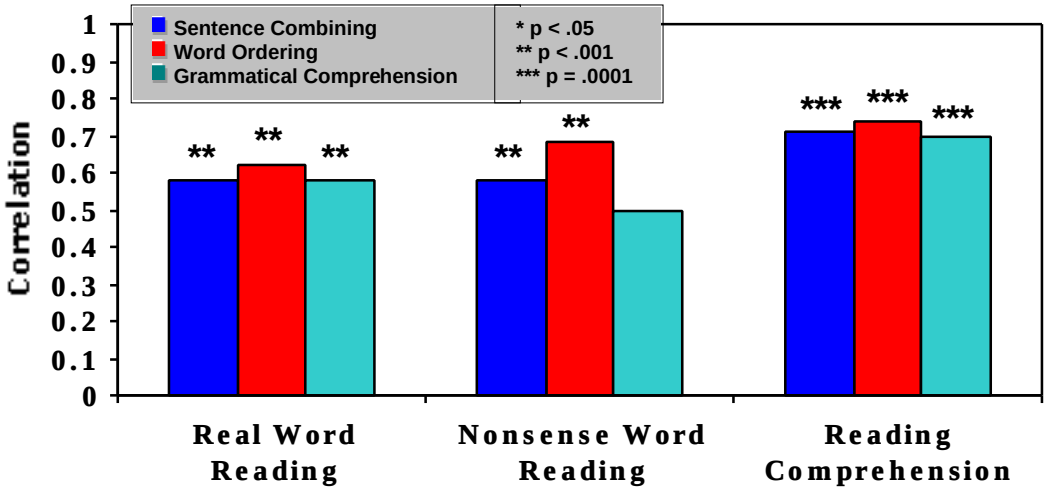
Correlations of TOLD-P:2 Grammatical Subtests and Specific Reading Skills



Result: For ***young children*** **(TOLD P:2)** ***sentence imitation*** was the only grammatical subtest significantly correlated with any reading skill.

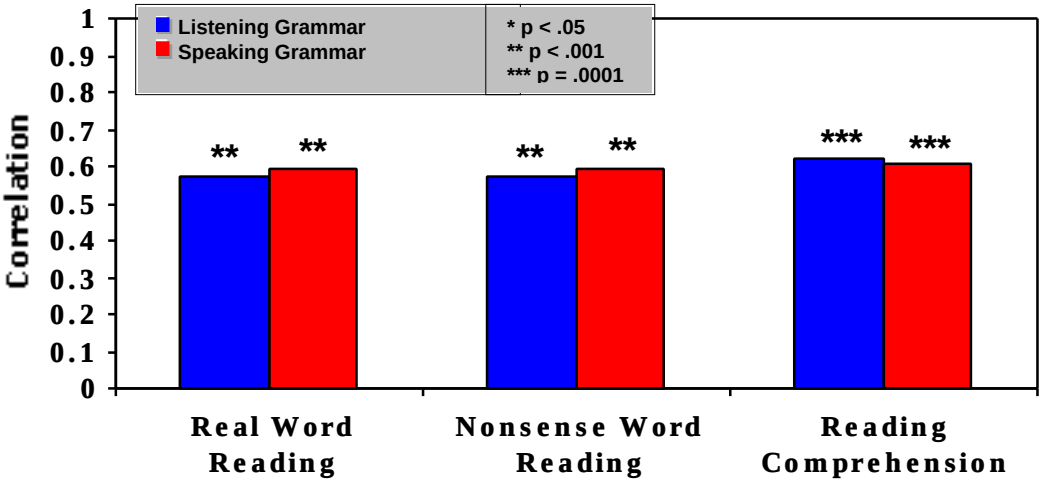
Results (...continued)

Correlations of TOLD-I:2 Grammatical Subtests and Specific Reading Skills



Result: For ***older children*** **(TOLD I:2)** ***all*** grammatical subtests were significantly correlated with all reading measures. Grammatical subtests of the TOLD I:2 were the best predictors of reading comprehension.

Correlations of TOAL-2 Grammatical Subtests and Specific Reading Skills

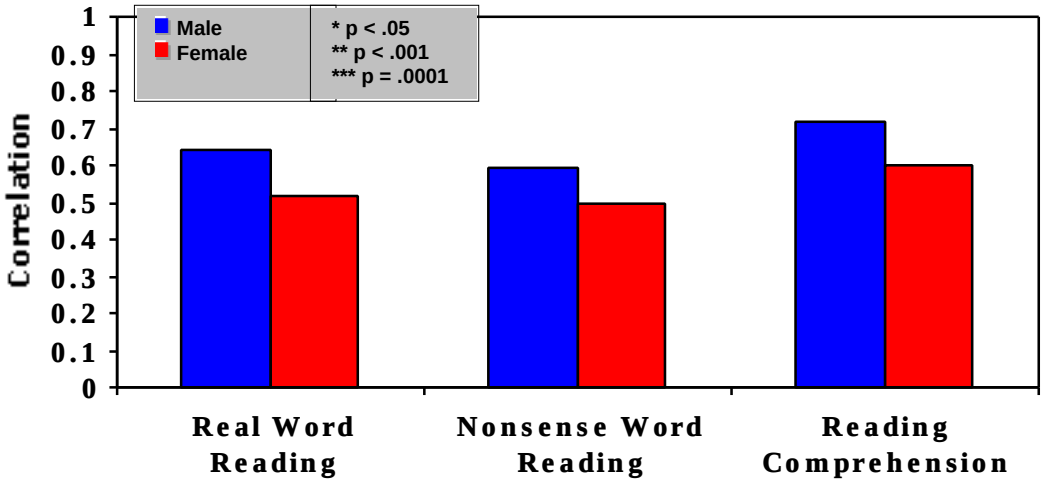


Result: For ***adults*** **(TOAL-2),** both ***listening*** and ***speaking*** grammatical subtests of the TOAL-2 were highly significantly correlated with all reading measures. By adulthood an individual's oral language and grammatical abilities were highly predictive of that individual's reading comprehension ability.

Results (...continued)

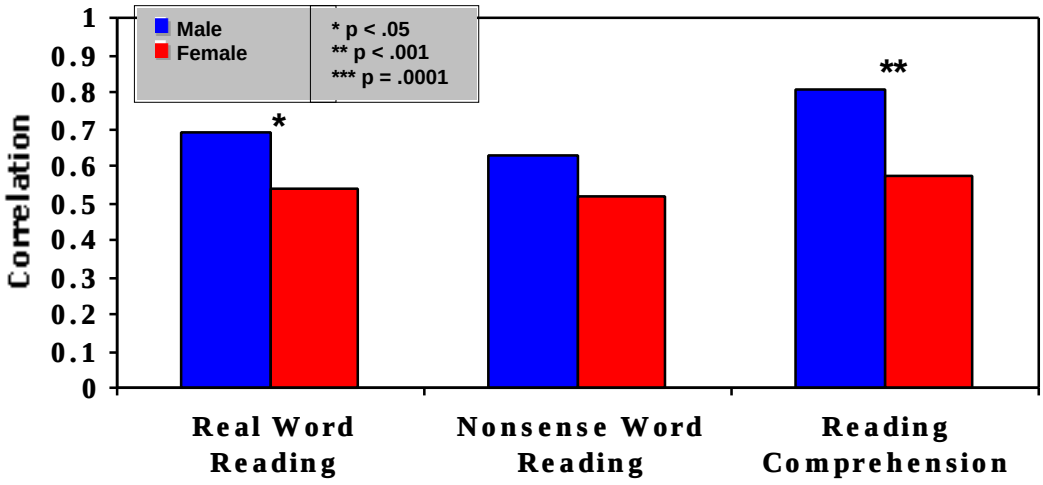
QUESTION 3: Are there any significant gender-specific differences in these relationships?

Gender Differences in Correlations of Receptive Language & Reading Skills



Result: For ***Receptive Language,*** there were no significant gender-based differences in the strength of the correlations.

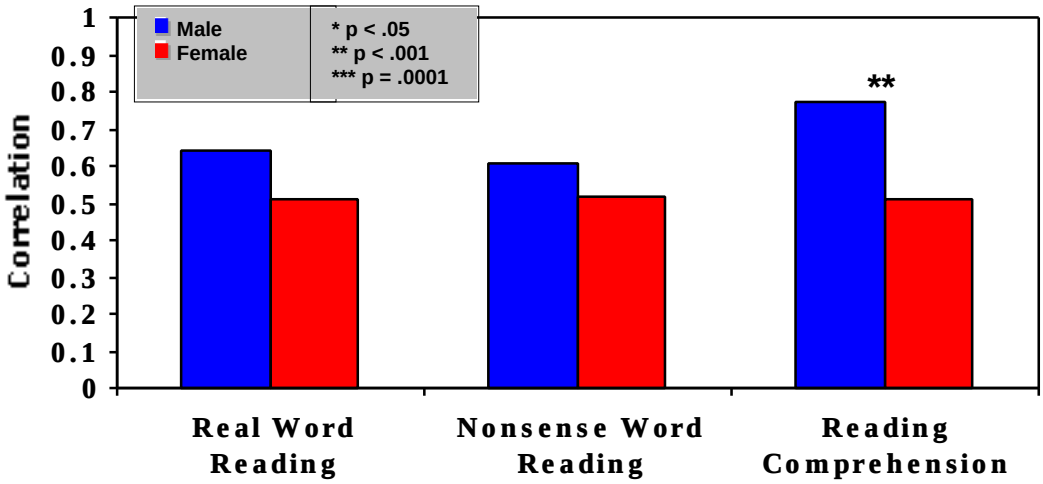
Gender Differences in Correlations of Expressive Language & Reading Skills



Result: For ***Expressive Language,*** correlations with ***real word reading*** and ***reading comprehension*** were stronger for males than females.

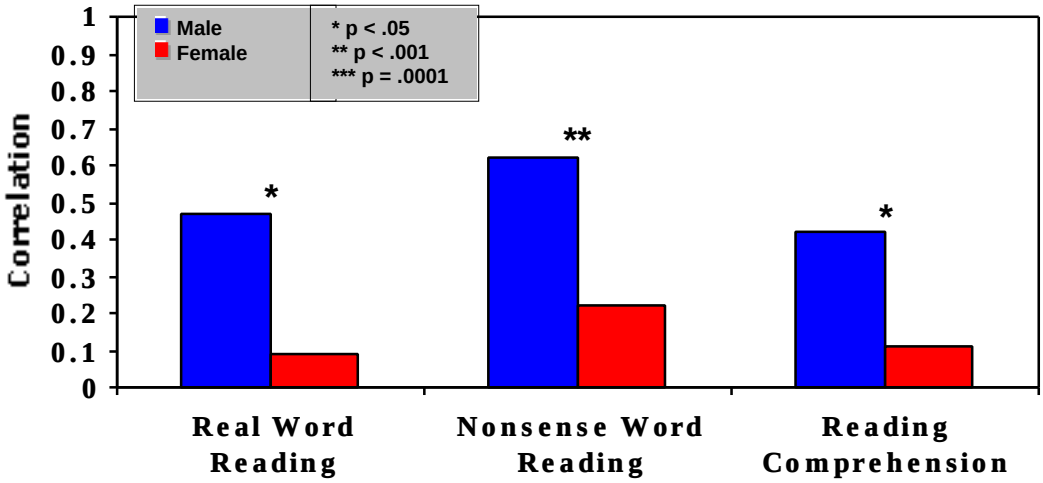
Results (...continued)

Gender Differences in Correlations of Grammatical Ability & Reading Skills



Results: For ***Grammatical Ability,*** correlations with ***reading comprehension*** were stronger for males than females.

Gender Differences in Correlations of Phonological Awareness & Reading Skills



Results: The ***Phonological Awareness*** task was significantly correlated with ***all*** measures of reading for males, whereas it was not significantly correlated with any reading measures for females. **Importantly, this finding suggests that previous reports of high predictive power of phonological awareness abilities for reading may be gender specific, applying only to males**.

Summary

In families with a history of specific language impairment most subtypes of language are significantly correlated with specific aspects of reading.

- Correlations were higher for adult measures than measures for children, with one exception. The phonological awareness task was more highly correlated with nonsense word reading in children than in adults.
- In children, the phonological awareness task was significantly correlated with nonsense word reading, but not with real word reading or reading comprehension.
- By adulthood, the phonological awareness task was significantly, but only weakly correlated with all reading measures. Higher-level receptive, expressive, and grammatical oral language abilities accounted for the most variance in reading performance.

For older children and adults, all grammatical subtests were significantly correlated with all reading measures. Yet, for younger children, only the Sentence Imitation task was significantly correlated with any reading skills.

There were significant gender differences in the correlations between language subtypes and specific reading skills.

- Most importantly, the correlations between the phonological awareness task and all reading measures were significant only for males. None were significant for females.
- Expressive language correlations for real word reading and reading comprehension were significantly different for males and females.
- Grammatical ability correlations for reading comprehension were significantly different for males and females.
- There were no gender differences in correlations between receptive language and reading skills. These correlations were equally high for males and females.

Conclusions

These data demonstrate that all areas of oral language predict single word reading, decoding, and reading comprehension abilities. No particular language subtype was found to be more associated than the others with any specific reading skill. It is noteworthy, however, that reading comprehension was the skill most significantly correlated with all language measures. These data suggest that success in comprehending what is read is not simply a matter of decoding written language. It is highly dependent an individual's ability to understand and use oral language.

The results strongly support the importance of assessing oral language in individuals who present with reading disabilities. These results also strongly support the importance of including oral language remediation in the educational plan for individuals with reading deficits.

This research was supported by NIDCD Grant R01-DC01854 to Paula Tallal.

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