

# Spelling Performance of Children with Speech-Sound Disorder and/or Language Impairment

JoAnne White Berns, Krystal Werfel, and C. Melanie Schuele  
Vanderbilt University Medical Center

Barbara Lewis  
Case Western Reserve University

## Introduction

The development of literacy skills, including spelling, is reliant on linguistic skills. Thus it is reasonable to conclude that difficulties with speech and/or language acquisition may lead to difficulties with literacy. Literacy can be broadly divided into the sub-components of reading (word recognition, comprehension) and writing (written expression, spelling). It is well established that children with language impairment (LI) are at an increased risk for reading difficulties (Catts, Fey, Tomblin, & Zhang, 2002). There is less consensus regarding the literacy skills of children with speech-sound disorder (SSD). Some studies find children with SSD are at an increased risk for reading difficulties (Anthony, et al., 2011; Bird, Bishop, & Freeman, 1995; Peterson, Pennington, Shriberg, & Boada, 2009) whereas others contest that children with SSD are not at any greater risk for reading difficulties than typical children (Bishop & Adams, 1990; Catts, 1993; Lewis & Freebairn, 1992).

As for children with comorbid SSD and LI, the general finding is that these children have worse reading outcomes than children with either disorder in isolation. Bishop and Adams (1990) found that among children with SSD, the comorbid presence of LI predicted a worse impact on learning to read than would be predicted by a child having SSD or LI in isolation. Peterson et al. (2009) found that 66.7% of children with comorbid SSD and LI developed a reading disability (RD) compared with 10.3% of children without SSD only. These deficits appear to be lifelong based on Lewis and Freebairn's (1992) finding that participants with a history of preschool SSD and LI consistently performed worse on measures of reading than those with a history of preschool SSD only from grade school through adulthood.

The study of spelling skills among children with speech and/or language impairments is somewhat limited as compared to the body of literature concerned with reading. The existing literature on spelling does suggest that children with speech and/or language impairments are at an increased risk for spelling difficulties. Although the speech-sound errors produced by children with SSD do not map directly onto their spellings (Ham, 1958; Stackhouse, 1996) children with SSD are more likely to misspell words they misarticulate than words they articulate correctly (Ham, 1958). Children with a history of SSD typically produce more phonologically based errors in their spelling than typically developing peers (Clarke-Klein & Hodson, 1995). Furthermore, children with LI have been found to consistently produce a greater quantity of spelling errors than age matched peers (Bishop & Clarkson, 2003; Lewis & Freebairn, 1992; Mackie & Dockrell, 2004).

The study of children with comorbid SSD and LI is especially limited. However, based on the aforementioned findings in both the spelling and reading literature, it is reasonable to postulate the combined influence of both disorders may pose a greater detriment to spelling than either disorder in isolation.

## Purpose

The purpose of this study was to (a) explore the differences in spelling performance among children with SSD and/or LI and (b) to compare holistic word scoring versus incremental scoring of word elements.

## Method

The data for this study is a subset of an extant longitudinal database entitled *A Family Study of Severe Phonology Disorders* (Lewis, 1996-Present). Participants were categorized into four groups: (1) SSD only, (2) LI only, (3) SSD + LI, and (4) typical speech and language. All children were administered a battery of language and literacy measures throughout grade school. This battery included the Test of Written Spelling (Larson & Hammill, 1999; TWS), a dependent measure in the present study.

To select the study participants from the extant database, TWS results of all participants between ages 8;0 – 10;11 were extracted. Ten participants for the present study were selected randomly from each of the four participant groups (n = 40).

### Test of Written Spelling

"The TWS is a norm-referenced test of spelling administered using a dictated word format...The TWS was developed after a review of 2,000 spelling rules. The words to be spelled are drawn from 10 basal spelling programs and popular graded word lists." (PRO-ED, 2009)

Example:

Pronunciation	Word	Sentence
'stāp	stop	1. Stop talking now.
'bed	bed	2. She slept on a bed.
'let	let	3. Please let me go.

### Spelling Sensitivity Score-Elements (SSS-E) Analysis

1. *Divide target word into elements.* Masterson and Apel (2010) define elements as phonemes, juncture changes, and affixes.

2. *Assign point value to elements.*

Point Value	Criteria
0 Points	omission of element
1 Point	spelled incorrectly, orthographically implausible
2 Points	spelled incorrectly, orthographically plausible
3 Points	correctly spelled

3. *Calculate Scores for Individual Words.*

Target word: ABLE					
	Child Spelling	A	B	LE	SSS-E <sup>a</sup>
Participant 1	ab	A (3)	B (3)	- (0)	2.00
Participant 2	abl	A (3)	B (3)	L (1)	2.33
Participant 3	abl	A (3)	B (3)	LL (2)	2.66
Participant 4	able	A (3)	B (3)	L (3)	3.00

<sup>a</sup> The SSS-E value is an average of point values awarded to each element within a word.

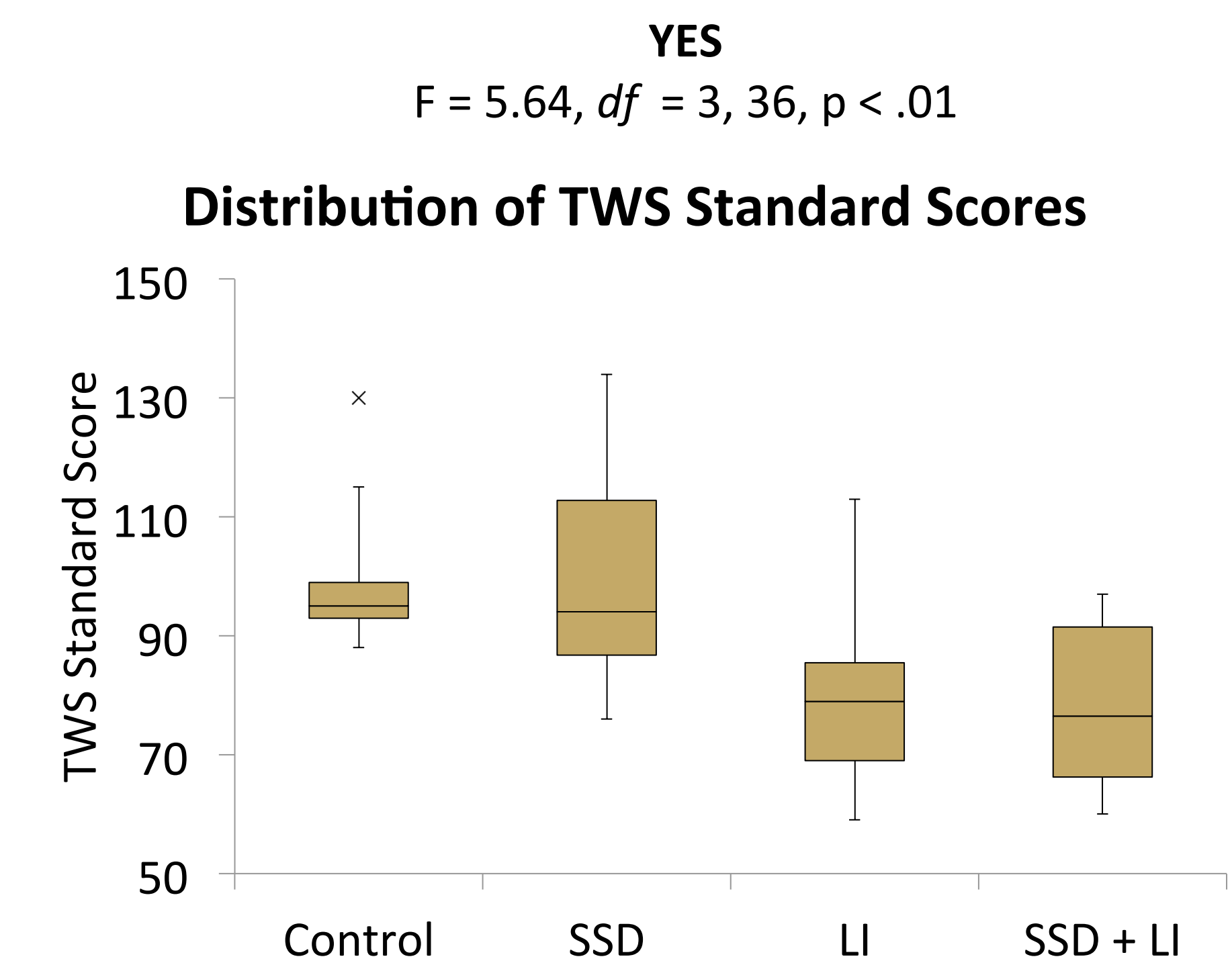
4. *Calculate SSS-E Value for Group of Words* by dividing the total number of element points awarded by the total number of elements in the sample.

5. *Interpret Score.*

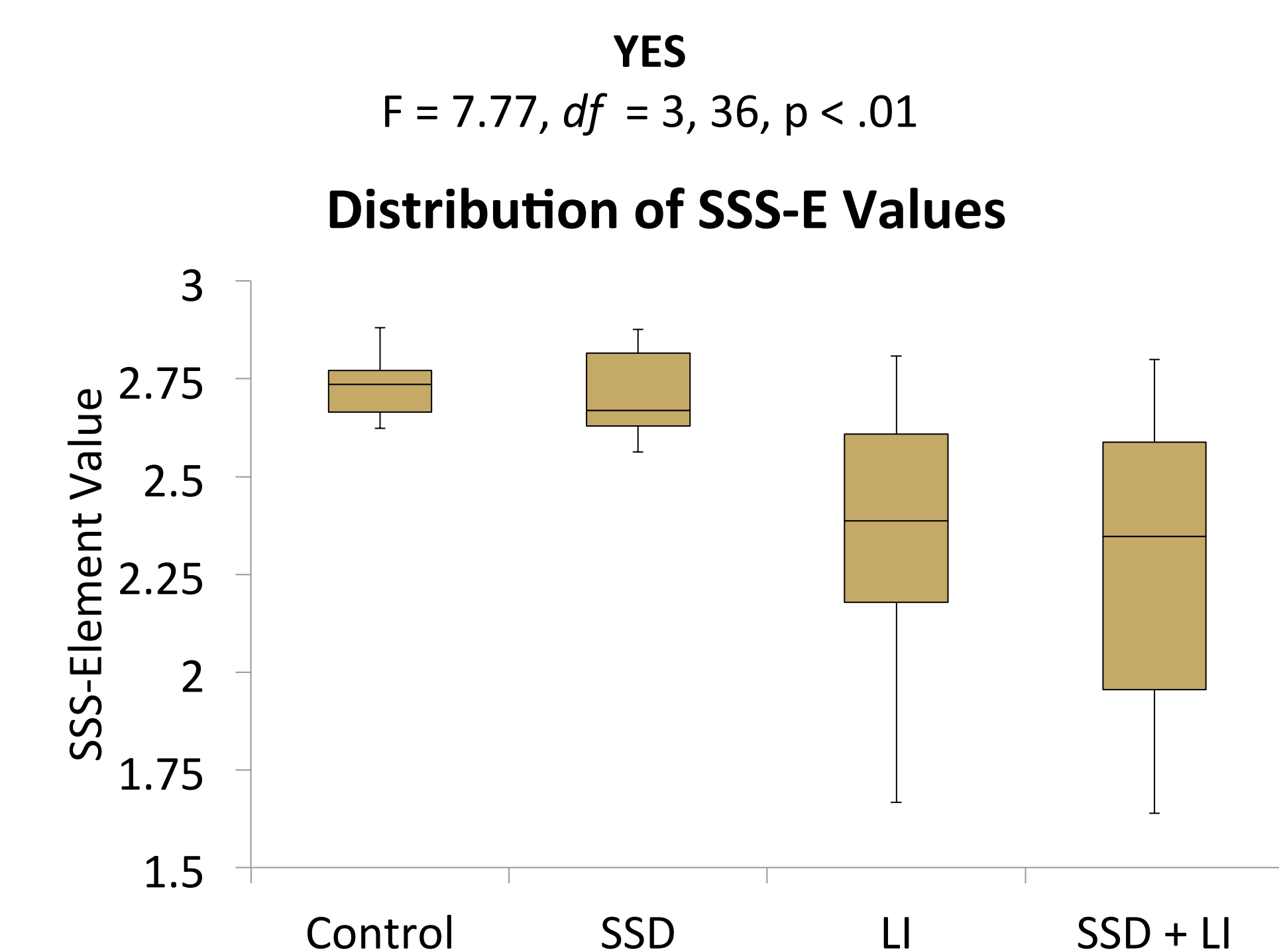
Score	Interpretation
<1.00	Speller typically does not represent all sounds in a word.
1.00-2.00	Speller typically represents all sounds but lacks appropriate use of orthographic conventions.
>2.00	Speller possesses adequate orthographic skills but struggles to use orthographic patterns in the correct conventional context.
3.00	Speller's spelling is correct.

## Results

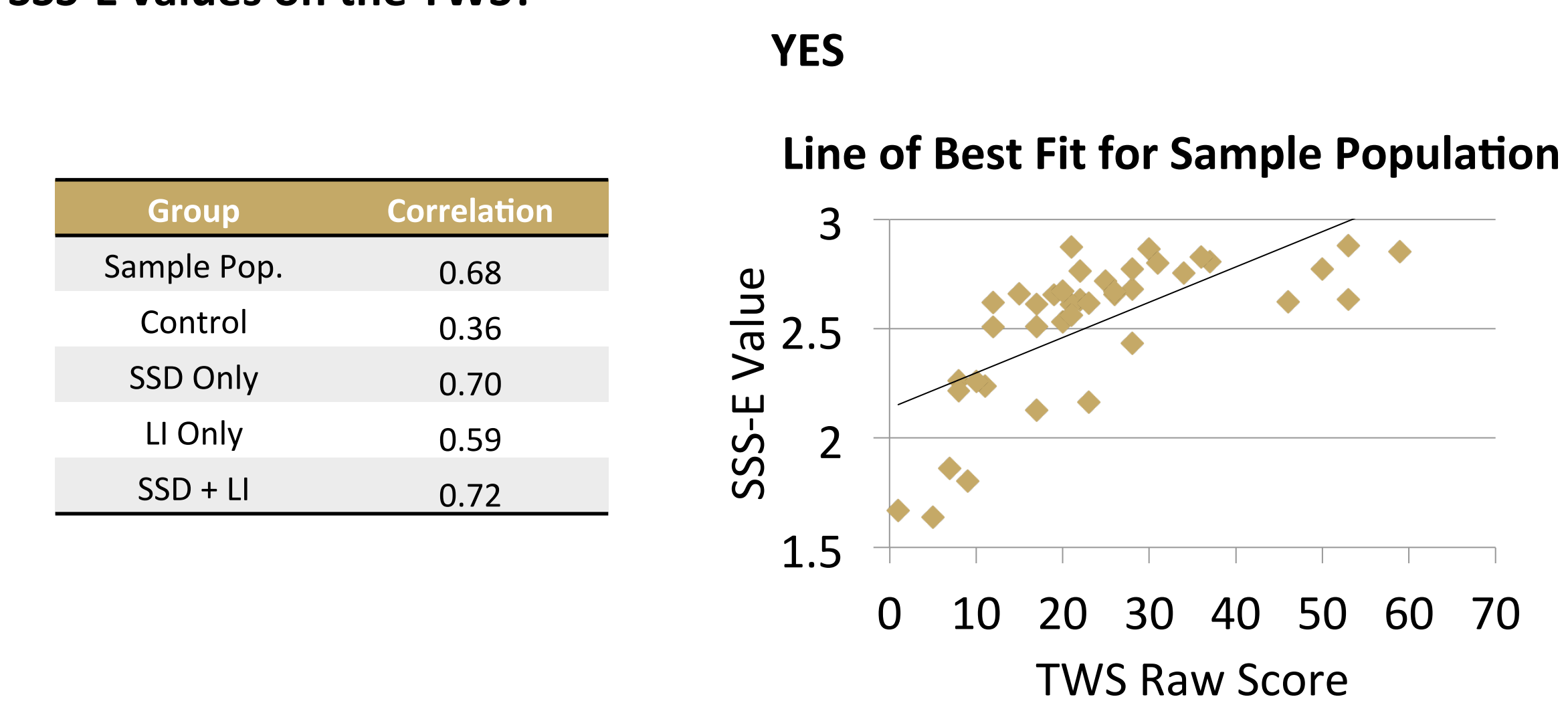
**Research Question #1: Do the standard scores on the Test of Written Spelling differ significantly across the four groups tested?**



**Research Question #2: Do the Spelling Sensitivity Score-Element values differ significantly across the four groups tested?**



**Research Question #3: Are the raw scores on the TWS correlated with the SSS-E values on the TWS?**



## Discussion

**Research Question #1: Do the standard scores on the Test of Written Spelling differ significantly across the four groups tested?**

The first analysis of the standard scores on the TWS indicated that participants with a diagnosis of LI with or without SSD had significantly lower standard scores than the control group. Participants with SSD only (M = 100, SD = 19) scored very similarly to the control group (M = 100, SD = 12). Despite similar means, the SSD group displayed much greater heterogeneity in performance than would be expected as compared to the test norms (SD = 15) and as compared to the control group. Further analysis of this wide distribution is warranted in order to determine the factors driving within-group differences. The variance within this group may have instructional implications.

Both the LI only and SSD only groups were compared statistically to the comorbid group. The standard scores of children with LI only did not vary significantly from the comorbid group, suggesting that these two groups demonstrate similar levels of spelling competency. Conversely, the SSD only group was significantly different from the comorbid group. These findings further support the notion that language impairment status confers risk for low spelling difficulties.

**Research Question #2: Do the Spelling Sensitivity Score-Element values differ significantly across the four groups tested?**

Participants with a diagnosis of LI, with or without SSD, had significantly lower SSS-E values than the control group. Interestingly, participants with LI only (M = 2.36, SD = .33) and SSD + LI (M = 2.28, SD = .39) displayed greater heterogeneity than would be expected as compared to the control group (M = 2.74, SD = .09). The within-group variance was greater than with the TWS standard scores. The heterogeneity present among the LI and SSD + LI population warrants further exploration of spelling skills within each participant group. The SSD only group did not vary significantly from the control using the SSS-E metric. Furthermore, the comorbid group's results were comparable to that of the LI only group but varied significantly from the SSD only group.

**Research Question #3: Are the raw scores on the TWS correlated with the SSS-E values on the TWS?**

Among the sample population, the raw scores on the TWS had a moderately strong correlation (0.68) with the SSS-E values. Although the TWS used holistic word scoring and the SSS-E used incremental word scoring, both measures assessed spelling proficiency. Thus it is not surprising that these two measures were correlated with one another. Interestingly, the control group had the lowest correlation (0.36) between measures. This was attributed to the lack of variance within the control group. As for clinical implications, both measures appeared to be a valid means of assessing spelling proficiency. The primary difference between these measures was that the TWS provided a norm-referenced measure of spelling and the SSS-E provided more qualitative analysis of spelling.

## Acknowledgements

Completion of this study and preparation of this poster was supported by (1) the National Institutes of Health, National Institute on Deafness and Other Communication Disorders, Grant DC00528 awarded to Case Western Reserve, PI: Barbara A. Lewis, PhD (2) United States Department of Education, Personnel Preparation Grant H325K090304 and H325D080075 awarded to Vanderbilt University, PI: C. Melanie Schuele, PhD, 2010-2012 and (3) Students Preparing for Academic and Research Careers (SPARC) award, JoAnne White Berns, 2011.

The authors have no conflict, financial or otherwise, to disclose.

LIST OF CITED REFERENCES AVAILABLE ON REQUEST

[www.mc.vanderbilt.edu/LANGUAGELAB](http://www.mc.vanderbilt.edu/LANGUAGELAB)

Poster presented at the American Speech-Language Hearing Association Convention: Atlanta, Georgia November 2012