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An exploratory study of the associations between speech and language difficulties and phonological awareness in preschool children

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ABSTRACT

A subset of pre-school children (4 to 7%) experience speech and/or language impairments that may put them at risk for future reading difficulties. In this study, 126 preschool children referred for speech and language therapy were assessed to explore the extent to which specific language and/or speech impairments were associated with the development of phonological awareness – a foundational skill upon which children build skills in conventional reading and writing. Results of this study indicate that children with specific language impairments were most at risk for phonological awareness difficulties whereas the severity of speech impairment was not a significant risk factor.

INTRODUCTION

As children progress through elementary schools most learn to read without much difficulty. However, a small subset of children (10 to 15%) experience significant difficulties with this process (Snow, Burns & Griffin, 1998). In recent years, researchers have acknowledged that identifying and supporting children who experience difficulties with reading as early as possible is crucial in order to prevent a host of negative outcomes that have been associated with reading difficulties. This study focuses on a particular subset of preschool children who may be at specific risk for developing reading difficulties later in their elementary school years. The Canadian Association of Speech-Language Pathologists and Audiologists (2005) estimate that 4 to 7% of preschoolers in Canada have a communication impairment in speech and/or language development. Children with speech impairments have difficulties in speech sound production that impact their articulation and speech intelligibility (Schuele, 2004; Snowling & Haylou-Thomas, 2006), whereas children with language impairments have expressive and/or receptive language deficits in language processes such as vocabulary or grammar (Schuele, 2004; Snowling & Haylou-Thomas, 2006). However, although some children experience speech and language impairment concurrently, speech and language difficulties are not necessarily comorbid (Schuele, 2004). Furthermore, there is some contention as to whether children with speech impairments or children with language impairments are more at risk for future reading difficulties (Nathan, Stackhouse, Goulandris, & Snowling, 2004). As such, the current study attempts to untangle the relationship between preschool speech and language impairments and the role these constructs play in children's reading development. Specifically, this study explores the associations between preschool speech and language impairments and phonological awareness – a pre-reading skill thought to be a significant predictive of later reading difficulties (Snow *et al*., 1998).

In general, researchers have called for earlier identification and effective programming for children who may be at risk for reading difficulties (Snow *et al*., 1998). It has been argued that early identification of those at risk for reading difficulties would enable professionals to limit the development of these problems and put at risk children back on the path toward normal reading development (Hurford & Schauf, 1994; Justice, Invernizzi & Meier, 2002; Lyon *et al*., 2001; Torgesen, Wagner & Rashotte, 1994). Over the past decade there has been a great deal of research focused on establishing kindergarten predictors of reading disabilities. For instance, Vervaeke, McNamara, and Scissons (2007) conducted a four-year longitudinal study following 650 children from Kindergarten to Grade 3 and found that letter identification and phonological awareness in Kindergarten were significant predictors of reading in Grade 3. However, Snow *et al*. (1998) suggest that children who are at risk for reading difficulties can be identified in the preschool years, prior to their entry into formal schooling.

Recently, research has focused on how preschool literacy-based skills such as letter identification and phonological awareness provide children with a foundation upon which they build skills in conventional reading and writing (Justice *et al*., 2002; Justice & Pullen, 2003; Lonigan, Burgess, & Anthony, 2000). For example, Lonigan *et al*. (2000) examined pre-school literacy skills and later reading abilities and found that early letter knowledge was perhaps the most important predictor of later reading achievement. In addition, children's phonological awareness (measured by their achievement on rhyme and alliteration oddity tasks, a blending task, and an elision task) in preschool was significantly related to children's decoding ability a year later. Together, letter knowledge and phonological awareness accounted for 54% of the variance in children's later reading abilities. In another important study, Catts, Fey, Zhang, and Tomblin (2001) assessed 604 kindergarten children with an assessment battery consisting of language tests, a nonverbal cognitive measure, a rapid automatized naming task, a measure of phonological awareness, and a letter identification task. Follow-up assessments of reading comprehension were completed in grade two. The results revealed that both phonological awareness and letter identification uniquely predicted the probability of reading comprehension difficulties in second grade above the other measures used in the study. Here again, letter identification was the single best predictor of later reading ability.

The current study is based on the established assumption that phonological awareness and letter identification are significant precursors to reading and furthermore, that children deficient in these skills in their preschool years are at risk for becoming poor readers. However, this study also focuses specifically on a subgroup of preschool children who have impairments in speech and/or language development and may be particularly at risk for poor phonological awareness and letter identification. Current research into speech and language impairments suggest that in general, early speech as well as early language difficulties are considered to be risk factors associated with future reading difficulties (Catts, 1993; Justice & Pullen, 2003; *Nathan et al*., 2004). However, speech and language difficulties are not necessarily comorbid. In fact, Schuele (2004) suggests that preschool speech and language

difficulties in children may manifest in three different profiles. First, children may experience speech impairments alone without any language-type impairments; second, children may experience language impairments alone without any speech impairments; and third, speech and language impairment may be comorbid affecting children in both domains. Due to this entangled relationship between speech and language there has been some debate among researchers about the degree to which either speech or language contributes more significantly to phonological awareness difficulties and ultimately, future reading problems. For this reason, the current study aims to further investigate the unique and combined role that speech and language impairments play in contributing to phonological awareness difficulties. However, it is important first to briefly examine the underlying structures of both language and speech impairments and their relationship to phonological awareness and reading.

Language Impairments

In general, preschool language may be conceptualized as encompassing two broadly based constructs, namely expressive and receptive language. Children with an expressive language disorder often understand language better than they are able to communicate. An expressive language difficulty can be developmental (i.e. present from birth) or acquired (i.e. brain injury). Children with expressive language delays often do not talk much, although they generally understand language addressed to them. Causally, it is assumed that inherited expressive language disorders are associated with a functionally neurological processing problem (Vargha-Khadem *et al*., 1998). This neurological impairment is observed in children who experience problems retrieving and organizing words and sentences when expressing thoughts and ideas (Morales, n.d.).

In cases of receptive language disorder, children often do not understand language as they are presented with it. Here, it is assumed that a neurological processing problem creates problems for children understanding what is said to them (Vargha-Khadem *et al*., 1998). In many instances, children with receptive language difficulties also have expressive language difficulties simply because they cannot express what was not processed at the input stage of processing. Both expressive and receptive language difficulties occur in approximately 3 to 10 % of the general population (National Institute of Health, n.d.).

Reviewing the research on the impact of language on phonological awareness, many studies find a strong positive relationship between the two constructs. Specifically, Metsala (1999) found a strong correlational relationship between receptive language skills (i.e. receptive vocabulary size) and phonological awareness in a sample of 4- to 6-year old children. Similar findings were suggested by Snow, Tabeers, Nicholson and Kurland (1995) who found that semantic skills associated with expressive language were significantly correlated with the phonological skills of initial and final sound identification. More recently, Cooper, Roth, Speece, and Scharschneider (2002) found both expressive and receptive language skills were significant predictors of phonological awareness skills in 4 and 5-year old children, even more so than home background factors. In fact, some researchers argue that

within clinical populations of children referred for speech and language difficulties, it is specifically the language impairment, and not the speech deficit, that may be the main contributing factor leading to poor literacy outcomes later in life (Catts, 1993; Catts, *et al*., 2002; Nathan, *et al*., 2004). In general, these researchers argue that it is because of critical hierarchical links between language development and phonological awareness that children with language difficulties are particularly at risk for poor literacy outcomes.

Speech Impairments

On the other side of this argument, researchers suggest that speech impairments contribute uniquely to increasing the risk of developing reading difficulties (Bird, Bishop, & Freeman, 1995; Carroll & Snowling, 2004; Catts, 1993; Larrivee & Catts, 1999; Rvachew, Oherg, Graburg & Heyding, 2003). Speech, often referred to as articulation, disorders in children may be defined as output problems with the way sounds are formed and strung together, usually characterized by substituting one sound for another (wabbit for rabbit), omitting a sound (han for hand), or distorting a sound (ship for sip) (American Speech and Hearing Association, n.d.). A child has an articulation problem when he or she produces sounds, syllables, or words incorrectly so that listeners do not understand what is being said (American Speech and Hearing Association, n.d.). Although some speech difficulties may be caused by structural problems such as a cleft palate or cerebral palsy, for most children no structural disabilities are evident. When no structural cause can be identified it is assumed that a neurologically-based processing problem has caused the speech impairment (American Speech and Hearing Association, n.d.).

Stackhouse and Wells (1997) offer a theoretical model where speech impairments are related to literacy outcomes. Within this model, speech-processing and written language abilities are highly interrelated. They explain that the speech-processing system is comprised of three parts: an input system that receives spoken information; lexical representations where information about words is stored in the form of semantic, phonological, motor, grammatical and orthographic representations; and an output system which is used for selecting and producing spoken language. Stackhouse and Wells (1997) argue that as children develop the entire three-part speech-processing system in order to communicate orally, they are concurrently developing an awareness of language structure and sounds. This awareness ultimately lends itself to written language development, as children are able to link spoken language with its written form. When children read, they rely on the speech-processing system to function appropriately in terms of both top-down processing, where lexical representations are accessed as children read and make sense of text, and bottom-up processing, which enables children to convert written text into spoken words. If these processes are disassociated and not developing in line with one another, children may experience difficulties learning to read. In particular, if the speech-processing system is not intact, the very important emergent literacy skills known as phonological awareness may not develop appropriately. Stackhouse and Wells (1997) explain that typical phonological tasks such as rhyme judgment, detection and production, and blending and manipulating phonemes are dependent

upon a functional speech-processing system. Children must make use of their lexical representations, either to make sense of information that is being inputted into their processing system (bottom-up processing), or to provide information which helps the child produce accurate output (top-down processing). In general, Stackhouse and Wells (1997) suggest that phonological awareness is the key link which connects spoken and written language.

The Present Study

Given the entangled relationship between language and speech impairments, the purpose of the current study was to understand the relationship between these constructs and more so, to examine whether children who experience either of these impairments are more at risk for phonological awareness difficulties. Specifically, this study asked three research questions:

1) Are distinct profiles of speech/language impairment evident within the current clinical sample of children with speech and language impairments?
2) Are particular profiles of children more at risk for future reading difficulties as defined by their scores on the Phonological Awareness Literacy Screen, a measure indicated to predict later reading achievement?
3) How is the association between language impairments and phonological awareness different from the association between speech impairments and phonological awareness in preschool children with speech and/or language impairments?

The findings of this study hold important implications. From a research perspective, the current study adds to the field's theoretical understanding of constructs of speech and language impairment. It is important to untangle the relationship between these two constructs, as understanding the unique processes underlying both speech and language impairments will lead the field to better methods of early identification and more advanced and supportive remedial therapies. From a practical perspective, this study may point to the need for policy-makers to devote resources to providing preschool children with speech and/or language impairments with early interventions that extend beyond traditional speech and/or language therapies to include interventions focusing also on phonological awareness and letter identification. Increasing the scope of traditional speech and language therapies to include pre-reading skills may have an important long-term impact on children's reading development.

METHOD

Participants

The participants of this study were 126 preschool children born in 2002 referred for speech-language services to Speech Services Niagara (SSN). Each year, SSN serves approximately 1900 pre-school children who are demonstrating difficulties in their speech and/or language development. Over 80% of referrals to SSN come from parents or the community and the remainder come from physicians. Children are generally referred to SSN for language delays (lack of or fewer words than expected for their age; syntactical or morphological errors) and for speech delays (articulation/phonology, voice, fluency). Of the 126 children participating in the current study, 86 were male and 40 were female. Participants were between the ages of 37 and 59 months at their first assessment session with a sample mean age of 49.4 months. Participating children were from a primarily middle-class suburban area in Southern Ontario. Children with low incidence disabilities (i.e. developmental disabilities, hearing/visual impairments, cleft palate, tongue thrust) or significant ESL difficulties were not included as participants.

Measures

The study's first research objective was to identify the possible profiles of pre-school children with speech and language delays. In order to establish whether such profiles existed, each participant was assessed with one standardized measure of speech (Goldman Fristoe Test of Articulation – Second Edition, Goldman & Fristoe, 2000) and one standardized measure of language (Clinical Evaluation of Language Fundamentals –Preschool Second Edition, Wiig, Secord, & Semel, 2004). Both measures are described here.

Goldman Fristoe Test of Articulation – Second Edition. The GFTA-2 can be administered to children from the ages of 2.0 years and upward and provides information about a child's articulation ability by sampling both spontaneous and imitative sound production. Children respond to picture plates and verbal cues from the examiner with single-word answers that demonstrate common speech sounds. During the Sounds-in-Words subtest, the examiner elicits sounds as part of words using the picture plates and the question "What is it?" Examiner records whether the child produced the sound correctly, incorrectly, or did not produced the sound at all (Level 1 testing); or whether the child substituted another sound, omitted the sound, distorted the sound, or added a sound (Level 2 testing). The raw score is the total number of articulation errors. Raw scores are converted to standard scores with 90 percent and 95 percent confidence intervals, percentile ranks, and test-age equivalents using tables in the manual. During the Sounds-in-Sentences subtest, the examiner reads aloud two picture-based stories. The examinee then retells each story using the picture plates, which illustrate the gist of the story and target words. The recording procedure is similar to that for the Sounds-in-Words subtest and the results are to be compared to those from the Sounds-in-Words subtest. No score is calculated. During the Stimulability subtest, the examiner uses a set of picture plates in the easel and asks the

examinee to watch the examiner's mouth and to listen carefully as the examiner says a syllable, word, or sentence (in that order). The examiner tests only those sounds that were misarticulated during the Sounds-in-Words and/or Sounds-in Sentences subtests and only in the position in which the misarticulation occurred.

Clinical Evaluation of Language Fundamentals –Preschool - Second Edition. The CELF – P2 is a clinical tool for identifying and diagnosing language deficits in children aged 3 – 6 years. This test evaluates aspects of language necessary for preschool children to make the transition to the classroom. For this study, the CELF – P2 was administered individually by a trained speech and language pathologist. To answer our first research question, it was necessary to calculate an overall speech and language profile variable. The language component of this profile variable was represented by the CELF – P2 Core Language Score. This index score is a measure of general language ability that quantifies a child's overall language performance. The Core Language Score is calculated by summing the CELF – P2 Receptive and Expressive Language composite scores. Using Chronbach's alpha, the Receptive Language Index has an internal consistency reliability of $\alpha = .93$. The Receptive and Expressive Composite Score consists of three subtests described next.

Receptive Language Index. This composite score is a measure of listening and auditory comprehension. It is derived by summing the scaled scores from the Sentence Structure, the Concepts and Following Directions, and the Basic Concepts subtests. The Receptive Language Index has an internal consistency reliability of $\alpha = .94$.

Expressive Language Index. This composite score is a measure of expressive language skills. It is derived by summing the scaled scores from the Word Structure, the Expressive Vocabulary, and Recalling Sentences subtests. The Expressive Language Index has an internal consistency reliability of $\alpha = .94$.

The study's second research question asked to what extent do language and/or speech impairments influence phonological awareness skills in preschoolers. We addressed this question by assessing how children with language and/or speech impairments achieved on the *Phonological Awareness Literacy Screening – Pre-kindergarten* (PALS-PreK, Invernizzi, Sullivan, & Meier, 2001). The PALS-PreK measures have been established as significant predictors of later reading difficulties (Invernizzi *et al*., 2001).

Phonological Awareness Literacy Screening – Pre-kindergarten. The PALS - PreK is a phonological awareness screening tool that measures preschoolers' developing knowledge of important literacy fundamentals and offers guidelines to teachers for tailoring instruction to children's specific needs. The assessment reflects skills that are predictive of future reading success. The specific subtests of the PALS-PreK used in this study include:

Upper-case Letter Identification. In this subtest, children were shown all 26 upper-case letters of the English alphabet in random order and asked to give the letter name. Responses were scored as correct if they corresponded with the appropriate letter name.

Beginning Sound Awareness. In this subtest, the examiner says the name of a picture and asks the child to produce the beginning sounds for words that start with /s/, /m/, and /b/.

Print and Word Awareness. In this subtest, the examiner read a familiar nursery rhyme printed in a book format and asked the child to point to different components. In this natural book-reading context, children demonstrated their awareness of print concepts such as directionality and the difference between pictures, letters, and words.

Rhyme Awareness. In this subtest, the examiner showed the child pictures and names each picture. The examiner then asked the child to point to the picture that rhymes with the first one.

Procedures

All participants (n=126) were administered all three assessments (GFTA-2, CELF-P2, and the PALS-PreK). All three standardized assessments were administered to children individually by the Speech and Language Pathologist assigned to them. All three assessments were administered during children's first two visits to SSN prior to beginning therapy. All Speech and Language Pathologists were trained professionally to administer and score each of these assessments. Assessment data was collected for each child by the research team.

RESULTS AND DISCUSSION

The study's first research objective was to establish the possible profiles of children referred to SSN for therapy. To investigate the possible profiles, each child was assessed with the GFTA-2 and the CELF-P2. Raw scores on both the assessments were then converted to percentile rank scores using the normal curve equivalent data provided by each assessment manual. For both the GFTA-2 and the CELF-P2, scores in the 16th percentile and below were used to define children as severely delayed in either speech and/or language, scores between the 17th and 34th percentile were used to define children as moderately delayed in speech and/or language, and scores above the 34th percentile to defined children has having speech and/or language in or above the normal range. This scoring technique resulted in children being categorized in one of eight possible groups illustrated in Table 1.

Table 1: Description of Profile Groups Sorted by Level of Language Impairment

Profile Number Code	Language CELF–P2	Speech GFTA-2
1 (N = 17)	Severe (Below 16th %ile)	Severe (Below 16th %ile)
2 (N = 8)	Severe (Below 16th %ile)	Moderate (Between 17th and 34th %ile)
3 (N = 11)	Severe (Below 16th %ile)	No Impairment (35th %ile or above)
4 (N = 15)	Moderate (Between 17th and 34th %ile)	Severe (Below 16th %ile)
5 (N = 5)	Moderate (Between 17th and 34th %ile)	Moderate (Between 17th and 34th %ile)
6 (N = 9)	Moderate (Between 17th and 34th %ile)	No Impairment (35th %ile or above)
7 (N = 39)	No Impairment (35th %ile or above)	Severe (Below 16th %ile)
8 (N = 22)	No Impairment (35th %ile or above)	Moderate (Between 17th and 34th %ile)

The profile groups illustrated in Table 1 were numbered from 1 to 8 and, for the purpose of answering the study's research questions, the profile groups were first sorted by level of language impairment. In other words, profile groups 1 through 3 all had severe language impairments with various levels of speech impairments, groups 4 through 6 all had moderate language impairments with various levels of speech impairments, and groups 7 and 8 had no language impairments with various levels of speech impairments. It was also deemed important to establish the percentage of children who fell into each profile. In accordance with the GFTA-2 and the CELF-P2 percentile ranking described above, 17 (13.5%) of the 126 children participating in the study showed severe impairments in both language and speech. Eight (6.3%) had severe impairments in language with moderate speech impairments and 11 (8.7%) had severe impairments in language with no speech impairments.

Fifteen (11.9%) of the 126 children participating in the study showed moderate language impairments with severe speech impairments, five (4.0%) showed moderate impairments in both language and speech, and nine (7.1%) had moderate impairments in language with no speech impairments.

Thirty-nine (31.0%) of the 126 children participating in the study showed no language impairments with severe speech impairments and 22 (17.5%) had no language impairments and moderate speech impairments. As the current clinical sample included only children referred to Speech Services Niagara, there were no children that fell into a profile of no impairment in both language and speech.

In general, a simple frequency count of the children within each speech/language profile group indicated that the majority of children (42.1%) who were referred to SSN and who participated

in this study had severe or moderate speech impairment with no significant language impairment. In comparison, only 16% of children participating in this study had moderate or severe language impairments with no significant speech impairments. In clinical terms, most children referred to SSN presented with difficulties in speech articulation difficulties rather than language difficulties. This result isn't overly surprising and corresponds with the anecdotal accounts of the Director of and staff of SSN.

The study's second and third research questions asked about the phonological awareness skills of children in each speech/language profile group. Exploring the associations between phonological awareness and both speech and language impairment was important as early phonological awareness difficulties have been shown to be an important predictor of later reading difficulties (Snow *et al*., 1998). Further, if a particular profile group was to show significantly weaker phonological awareness skills it would be important to establish specific remedial strategies within the current SSN therapy frameworks. To explore the relationships between speech/language impairment and phonological awareness, all participating children were assessed with the *Phonological Awareness Literacy Screening – Pre-kindergarten* (PALS-PreK, Invernizzi, Sullivan, & Meier, 2001). As indicated previously, the PALS-PreK has been established as significant predictors of later reading difficulties (Invernizzi *et al*., 2001). PALS-PreK raw scores and standard deviations for each profile group are illustrated in Table 2.

Table 2: Means and Standard Deviations on the PALS Pre-K Measures for Speech/Language Profile Groups

	Severe Language Severe Speech		Severe Language Moderate Speech		Severe Language No Impair Speech		Moderate Language Severe Speech		Moderate Language Moderate Speech		Moderate Language No Impair Speech		No Impair Language Severe Speech		No Impair Language Moderate Speech	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	DS	Mean	SD	Mean	SD
PALS-PreK Upper-case Letter ID	3.00	2.52	3.38	2.82	3.20	2.01	6.07	2.26	5.00	4.12	12.11	3.61	16.18	5.98	17.35	6.59
PALS-PreK Beginning Sound Awareness	.94	.96	1.14	1.06	1.20	1.60	3.73	2.66	3.80	3.56	3.22	4.40	4.87	3.64	6.18	3.57
PALS-PreK Print and Word Awareness	1.35	1.57	1.37	1.21	2.60	2.17	4.26	2.08	5.00	1.87	6.22	1.86	6.35	2.49	7.30	2.00
PALS-PreK Rhyme Awareness	1.00	1.87	1.12	1.57	1.70	1.49	4.67	2.49	4.20	3.34	3.99	1.72	5.61	3.20	6.35	3.00

Visual inspection of the data in Table 2 indicated a general trend where increases in the PALS-PreK mean scores corresponded to a decrease in the level of language impairment. For example, the PALS-PreK Upper-case Letter ID scores for all three severe language profile groups ranged from 3.00 to 3.38 whereas for the no language impairment profile groups mean scores ranged from 16.18 to 17.35. Similar trends were noted each of the PALS-PreK measures. However, these data do not indicate whether any of the profile groups should be considered particularly at risk in their phonological awareness skills. To address this question, we measured the number of children from each profile group who fell below the Spring Developmental Range scores reported in the PALS-PreK technical data (Invernizzi *et al*., 2001).The PALS-PreK Spring Developmental Range Scores were established by Invernizzi et al. who examined PALS-PreK scores of approximately 350 children who were identified as successful readers in first grade. In general, the reported range scores were not standard scores but rather scores that reflect the range of scores that could be considered typical for 4-year old children. As such, Invernizzi and colleagues caution that these range scores should not be used as diagnostic benchmarks but rather as a guide to identify children who may be considered at risk for weaker phonological awareness skills and subsequent reading difficulties. Spring Developmental Range scores for the PALS-PreK subtests used in this study are illustrated in Table 3.

Table 3: Spring Developmental Range Scores for the PALS-PreK Subtests

	Spring Developmental Range Scores	Maximum Score
PALS-PreK Upper-case Letter ID	12 - 21	26
PALS-PreK Beginning Sound Awareness	5 - 8	10
PALS-PreK Print and Word Awareness	7 - 9	10
PALS-PreK Rhyme Awareness	5 - 7	10

Using the Spring Developmental Norm scores as indicators of risk in phonological awareness, the number and percentage of children from each profile group who had PALS-PreK scores that fell below the Spring Developmental Norms are indicated in Table 4.

Table 4: Number and Percentage of Children Falling Below the PALS-PreK Spring Developmental Norm Scores for Speech/Language Profile Groups

	Profile Group 1 Severe Language Severe Speech	Profile Group 2 Severe Language Moderate Speech	Profile Group 3 Severe Language No Impair Speech	Profile Group 4 Moderate Language Severe Speech	Profile Group 5 Moderate Language Moderate Speech	Profile Group 6 Moderate Language No Impair Speech	Profile Group 7 No Impair Language Severe Speech	Profile Group 8 No Impair Language Moderate Speech
	(N=17)	(N=8)	(N=11)	(N=15)	(N=5)	(N=9)	(N=39)	(N=22)
PALS-PreK Upper-case Letter ID	15 /17 (88.2%)	8 /8 (100%)	10 /11 (91%)	12 / 15 (80%)	5 / 5 (100%)	5 / 9 (55.5%)	11 / 39 (28.2%)	3 / 22 (13.6%)
PALS-PreK Beginning Sound Awareness	17 /17 (100%)	8 / 8 (100%)	10 / 11 (92%)	9 / 15 (60%)	3 / 5 (60%)	5 / 9 (55.5%)	15 / 39 (38.5%)	7 / 22 (36.4%)
PALS-PreK Print and Word Awareness	17 /17 (100%)	8 / 8 (100%)	11 / 11 (100%)	13 / 15 (86.7%)	3 / 5 (60%)	4 / 9 (44.4%)	16 / 39 (41.%)	8 / 22 (36.4%)
PALS-PreK Rhyme Awareness	15 /17 (88.2%)	8 / 8 (100%)	11 / 11 (100%)	8 / 15 (53.3%)	4 / 5 (80%)	6 / 9 (66.6%)	14 / 39 (35.9%)	5 / 22 (22.7%)

For all four of the PALS-PreK measures, between 88.2 and 100% of children with severe language impairments, regardless of their speech impairments (profile groups 1 through 3), had scores that fell below the Spring Developmental Norm. In fact, in eight of the twelve severe language profile group cells, 100% of children had scores below the Spring Developmental Norm. This result invited that notion that children referred to SSN with severe language impairments may be particularly at risk for phonological awareness difficulties. The data in Table 4 also indicated that as children's language impairment decreased from severe, to moderate, and again to no impairment, a commensurate decrease occurred in the percentage of children who had PALS-PreK scores that fell below the Spring Developmental Norm. In general, more severe language impairments were associated with scores on the PALS-PreK that would be considered at risk. To further test this association correlational analyses were conducted between the profile group variable and the four PALS-PreK measures. Correlations are illustrated in Table 5.

Table 5: Pearson Correlation Coefficients for Profile Groups Sorted by Severity of Language Impairment and Measures of the PALS-PreK

	1	2	3	4	5
1 Profile Group	--				
2 PALS-PreK Upper Case Letter ID	0.69*	--			
3 PALS-PreK Beginning Sound Awareness	0.52*	0.51*	--		
4 PALS-PreK Print and Word Awareness	0.67*	0.66*	0.60*	--	
5 PALS-PreK Rhyme Awareness	0.50*	0.52*	0.56*	0.50*	--

** $p < .001$*

Results indicated strong significant correlations between profile group and all four PASL-PreK measures ranging from r=.51 to r=.69. These correlations point to the significant association between severity of language impairment and phonological awareness abilities. In other words, children with more severe language impairments tend to also have weaker phonological awareness skills.

A potential caveat to these findings asks whether the same associations would be found if the profile groups were grouped by level of speech impairment rather than by level of language impairment. To assess whether such a relationship existed, profile groups were reconfigured and sorted by level of speech impairment, illustrated in Table 6. In this configuration, profile groups 1 through 3 all had severe speech impairments with various levels of language impairments, groups 4 through 6 all had moderate speech impairments with various levels of language impairments, and groups 7 and 8 had no speech impairments with various levels of language impairments. In addition to the profile grouping, Table 6 also illustrated the percentage of children in each profile group who had PALS-PreK scores that fell below the Spring Developmental Norms.

Table 6: Number and Percentage of Children Falling Below the PALS-PreK Spring Developmental Norm Scores for Speech/Language Profile Groups Sorted by Level of Speech Impairment

	Profile Group 1 Severe Speech Severe Language	Profile Group 2 Severe Speech Moderate Language	Profile Group 3 Severe Speech No Impair Language	Profile Group 4 Moderate Speech Severe Language	Profile Group 5 Moderate Speech Moderate Language	Profile Group 6 Moderate Speech No Impair Language	Profile Group 7 No Impair Speech Severe Language	Profile Group 8 No Impair Speech Moderate Language
	(N=17)	(N=15)	(N=39)	(N=8)	(N=5)	(N=22)	(N=11)	(N=9)
PALS-PreK Upper-case Letter ID	15 /17 (88.2%)	12 / 15 (80%)	11 /39 (28.2%)	8 / 8 (100%)	5 / 5 (100%)	3 / 22 (13.7%)	10 / 11 (91%)	5 / 9 (55.6%)
PALS-PreK Beginning Sound Awareness	17 /17 (100%)	9 / 15 (60%)	15 / 39 (38.5%)	8 / 8 (100%)	3 / 5 (60%)	7 / 22 (31.8%)	10 / 11 (91%)	5 / 9 (55.6%)
PALS-PreK Print and Word Awareness	17 /17 (100%)	13 / 15 (86.7%)	16 / 39 (41%)	8 / 8 (100%)	3 / 5 (60%)	8 / 22 (36.3%)	11 / 11 (100%)	4 / 9 (44.4%)
PALS-PreK Rhyme Awareness	15 /17 (88.2%)	8 / 15 (53.3%)	14 / 39 (35.9%)	8 / 8 (100%)	4 / 5 (80%)	5 / 22 (22.7%)	11 / 11 (1001%)	6 / 9 (66.7%)

Unlike when the data was sorted by level of language impairment, visual inspection of these data revealed no definitive pattern whereby level of speech impairment was commensurate with the number of children scoring below the Spring Developmental Norm. In fact, the percentage of children falling below the Spring Developmental Norm was higher in each of the cells that included children with severe language impairments rather than severe speech impairments. To measure these associations empirically correlations were computed for the profile group measure (sorted by speech impairment) and each of the four PALS-PreK measures. Correlations are illustrated in Table 7.

Table 7: Pearson Correlation Coefficients for Profile Groups Sorted by Level of Speech Impairment and Measures of the PALS-PreK

	1	2	3	4	5
1 Profile Group	--				
2 PALS-PreK Upper Case Letter ID	0.17	--			
3 PALS-PreK Beginning Sound Awareness	0.11	0.51*	--		
4 PALS-PreK Print and Word Awareness	0.21*	0.66*	0.60*	--	
5 PALS-PreK Rhyme Awareness	0.03	0.52*	0.56*	0.50*	--

* $p < .05$

Unlike when the profile group measure sorted by language impairment, this profile group measure was only weakly and mostly non-significantly correlated with each of the PALS-PreK measures (ranging from r=.03 to r=.21). In other words, this result supported the hypothesis that it is the language impairment, and not the speech impairment, that is associated with weaker phonological awareness skills.

CONCLUSION

The current study asked three related questions: First, are distinct profiles of speech and/or language impairments are evident in preschoolers referred for speech and language services? Similar to Schuele (2004), this study found that profiles emerged where children could have severe, moderate or no impairments in both speech and language independently and could also experience both impairments comorbidly with different levels of severity. However, the second and third research questions extend this and asked whether certain profiles of children were more at risk for becoming poor readers. This question was answered by exploring how each group performed on the PALS-PreK – a set of phonological awareness measures that have been established as significant predictors of later reading difficulties (Invernizzi *et al*., 2001). The results indicated that children with severe language impairments, regardless of the level of their speech impairment, were most at risk for future reading difficulties as defined by their achievement on the PALS-PreK. This association was evidenced further in the correlational analyses where the profile variable, grouped by level of language impairment, was significantly correlated with all four measures of the PALS-PreK. When the profile group variable was grouped by level speech impairments, there was no significant association between speech impairment and phonological awareness.

In general, with all four measures of phonological awareness, children with severe language impairments, regardless of their level of speech impairment, were most at risk for having weaker phonological awareness abilities. This result indicates that speech impairments had little impact on children's PALS-PreK achievement. Further, this result suggests a positive outlook for children with speech impairments in their future literacy achievement. The overall results of this study lend to support to previous findings such as Nathan et al. (2004) who found that children with speech problems alone were the least at risk for developing future reading problems and that it was the language impairment that put children most at risk for developing poor phonological awareness and also future reading difficulties.

It is important to note the limitations of the current study. First, although the overall sample size (n=126) was sufficiently large, establishing profile groups resulted in some smaller cell sizes. Small cell sizes combined with the often skewed distribution of PALS-PreK scores caused by the nature of the clinical sample prohibited the use parametric statistics. Instead, this study adopted an approach whereby associations between constructs were explored through frequency distributions and correlational analyses. Future research would benefit from parametric statistical analyses using larger cell sizes. A second limitation is the absence of a normally achieving control group. To address this, standardized assessments were used enabling the comparison of this clinical sample to the normal standardized percentile ranks provided in each assessment manual. Third, the study did not include measures of previous instructions in phonological awareness and letter identification and, as such, children coming into the study had various prior levels of instruction in these areas. Finally, a recommendation for future research is to longitudinally study the effects of speech and language impairments on later reading achievement.

Couching these results in current theoretical frameworks of early speech, language and literacy, it may be that the children with language impairments in this study represent a group of preschool children who are experiencing expressive and/or receptive language difficulties that are acting as precursors to impairments in phonological awareness–a skill that significantly predicts reading achievement. On the other hand, children with isolated speech or articulation difficulties may not be at serious risk for developing reading difficulties. In fact, the reading-based outlook for children with speech impairments may be quite good. Furthermore, these findings hold important implications. Theoretically, it may be that speech and language impairments in young children represent distinct constructs that can be uniquely and comorbidly affected. Distinguishing between the constructs of speech and language impairments has important practical implications. Policy-makers and service providers concerned about young children with speech and language impairments may need to think differently about how their services are delivered. It may be that children with specific language impairments require support that extends beyond more traditional speech and language services regimes. Preschool children demonstrating specific language impairments, with or without comorbid speech impairments, may require specific therapy that includes explicit focus on phonological awareness and letter identification

skills. Building early language therapies that include components of phonological awareness and letter identification may decrease the likelihood that children with specific language impairments will develop reading difficulties later in the elementary school years. In sum, it is important that all stakeholders concerned with young children with speech and language impairments turn their efforts to facilitating phonological awareness and letter identification skills in the preschool years – particularly to those children who are demonstrating early language problems.

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