

# Sub-grouping preschool greek children with specific language impairment

## Abstract

Children with specific language impairment have been found to exhibit deficits in their expressive vocabulary, grammar and phonology. The purpose of the present study was to investigate these linguistic components in Greek preschool children with specific language impairment. The profiles of a group of 22 children with specific language impairment aged 4-6years were examined using tests standardized to the Greek population regarding expressive vocabulary, grammar and phonology. Results showed that all children performed poorly on the phonological test, lagging significantly behind their chronological age, while the majority of younger children (4-5years old) faced concomitant vocabulary and/or grammatical difficulties. No significant differences were found regarding gender. Phonology seems to be the most likely source of difficulties in Greek children with specific language impairment. These results are discussed with respect to their diagnostic implications and their relevance in therapeutic planning and intervention.

**Keywords:** specific speech and/or language impairment, vocabulary, grammar, phonology

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**Abbreviation:** SLI, specific language impairment; IPA, international phonetic alphabet

## Introduction

Specific language impairment (SLI) is defined as a significant deficit in language ability that cannot be attributed to hearing loss, low nonverbal intelligence, or neurological damage, is exhibited in approximately 7% of the population, is diagnosed in nearly all cases during the preschool years and often persists through adolescence and into adulthood.<sup>1</sup> Children with SLI show a delay in language comprehension and/or production<sup>2</sup> and differ in the degree to which they have problems articulating speech sounds, expressing themselves verbally and comprehending the speech of others.<sup>3</sup>

In the past, factors such as poor parenting, subtle brain damage around the time of birth or transient hearing loss were assumed to cause SLI.<sup>4</sup> Subsequently, genetic factors became apparent that play a role in the etiology of speech and language impairment.<sup>4-6</sup> Tomblin<sup>7</sup> found greater rates of near relatives with language learning problems among children with SLI than among children without SLI.

Bishop<sup>5</sup> has suggested six hypotheses for the etiology of SLI. The first hypothesis claims that the process of converting underlying knowledge into a speech signal may be impaired resulting in speech output problems. The second hypothesis supports that auditory perception and the course of language acquisition may be impaired. According to the third hypothesis, the linguistic mechanisms responsible for morpho-syntactic knowledge may be impaired. The fourth hypothesis is based on a deficit in conceptual development affecting language processing. The last two hypotheses view language problems in a broader cognitive context, that is, that there may be a failure to apply the appropriate hypothesis-testing procedures during the language-learning process or that there may exist a more general limitation in the speed and capacity of the child's information-processing system. SLI has also been explained by the procedural deficit hypothesis which supports that abnormal development of brain structures that constitute the procedural memory system, such as the Broca's area in the frontal cortex and the caudate nucleus in the basal ganglia, are responsible for the linguistic dysfunction.<sup>8</sup> Prenatal

alterations of brain development in children with SLI have also been suggested by Plante et al.,<sup>9</sup>

Conti-Ramsden et al.,<sup>10</sup> proposed six clusters of children with SLI when they conducted a study employing both cluster analysis and teacher judgment. Cluster 1 consisted of children with grammatical comprehension difficulties, word reading limitations and storytelling problems, whose phonology and expressive vocabulary skills were adequate. Cluster 2 referred to children originally identified as SLI, but who scored within the normal range on all tests by the time of the study. Cluster 3 was represented by children with adequate expressive vocabulary, but weaknesses in all other areas. Cluster 4 resembled cluster 3 except that test scores were generally higher, although expressive vocabulary did not stand out as a relative strength. Cluster 5 children scored poorly on all tests. Cluster 6 children had difficulties primarily in retelling a story and their problems with language were most apparent at the discourse level. Conti-Ramsden & Botting,<sup>11</sup> upon retesting these children one year later, found that many children had changed their profile and were placed in a different cluster from the one they were in one year earlier.

Van Daal et al.,<sup>12</sup> using principal components analysis and a wide variety of language and processing tasks suggested four subtypes of children with SLI: lexical-semantic, speech production, syntactic-sequential and auditory perception. The syntactic-sequential subtype referred to a possible link between weaknesses in grammatical comprehension and a problem in auditory sequential processing. The auditory perception subtype included difficulties with pragmatics, attention and auditory perception.

A different classification of children with SLI has been provided by Bishop et al.,<sup>6</sup> Four subgroups of children were identified in a set of 90 same-sex twin pairs: articulation difficulties with or without receptive disorder, articulation difficulties and expressive disorder with or without receptive disorder, expressive disorder with or without receptive disorder, and only receptive disorder.

In the present study, 4-6year-old children with SLI in Greece were assessed in expressive vocabulary, grammar and phonology. The first aim was to investigate the linguistic components of expressive

vocabulary, grammar and phonology in preschool Greek children with SLI. The second aim was to classify preschool Greek children with SLI. Finally, the third aim was to explore differences regarding age and gender.

## Materials and methods

### Participants

All participants were diagnosed with SLI by a multidisciplinary team of specialists consisting of a speech and language therapist, an occupational therapist, a psychologist, a psychiatrist, a social worker and a special educator at a community mental health center in Greece. A child was diagnosed with SLI when he or she had a severe language impairment that was not the result of intellectual, sensory, motor, emotional or physical impairment. The participants were attending mainstream schools, either kindergarten or primary school. 22 Greek children aged 4;0-6;0years participated in this study.

The 22 children were divided into two groups according to their age: group 1 (11 children aged 4;0-5;0years) and group 2 (11 children aged 5;0-6;0years). Group 1 consisted of 5 boys and 6 girls, while group 2 consisted of 6 boys and 5 girls.

### Materials

The participants were tested on 3 speech and language assessments standardized in the Greek language:

- Test of Expressive Vocabulary,<sup>13</sup>
- Action Pictures: The Test of Information and Grammatical Efficiency,<sup>14</sup>
- Test of Phonemic and Phonological Development.<sup>15</sup>

The children's expressive vocabulary was evaluated using the Test of Expressive Vocabulary, which is a standardized test for lexical skills of 4- to 8-year-olds. Children were asked to name 50 black and white pictures. The children's grammar skills were assessed using Action Pictures: The Test of Information and Grammatical Efficiency, which is a standardized test for morpho-syntactic and pragmatic skills of 4- to 7-year-olds. Children were asked to describe 10 color pictures depicting actions. Finally, the children's phonology was measured by the Test of Phonemic and Phonological Development which assesses the development of the Greek sound system of 2;6- to 6-year-olds. Children were asked to name 35 black and white pictures, which sampled all consonants in syllable-initial, medial and final positions, as well as consonant blends.

### Procedure

Each child was seen individually in a quiet area by a speech and language therapist from the mental health center, who first established rapport with the child prior to testing. Children were tested during a one hour session. The children's responses during testing were marked on the score sheet of each test. The children's responses in the Test of Phonetic and Phonological Development were transcribed online using the broad phonetic symbols from the International Phonetic Alphabet (IPA).

### The following measures were calculated

For the Test of Expressive Vocabulary percentiles and months lagging behind chronological age were calculated. For the Action Pictures: The Test of Information and Grammatical Efficiency only the scores for grammatical efficiency were taken into account

and were calculated also in percentiles and months lagging behind chronological age. As for the Test of Phonetic and Phonological Development only months lagging behind chronological age were calculated. Percentiles were not included in the last test.

### Statistical analysis

Quantitative variables were expressed as mean values (SD) or with median (interquartile range: IQR). Qualitative variables were expressed as absolute and relative frequencies. For the comparison of proportions chi-square and Fisher's exact tests were used. Independent samples Student's t-tests were used for the comparison of normal variable between two groups, while Mann-Whitney tests were used for the comparison of not normal variables between two groups. Wilcoxon signed rank tests were used to compare paired differences between expressive vocabulary, grammar and phonology as expressed in "months". All reported p values are two-tailed. Statistical significance was set at  $p < 0.05$  and analyses were conducted using SPSS statistical software (version 19.0).

### Results and discussion

The sample consisted of 22 children (11 aged 4 to 5years and 11 aged 5 to 6years), half of which were males. Table 1 presents mean and median values of expressive vocabulary, grammar and phonology. Significantly greater "months" were found for phonology, as compared with both grammar and expressive vocabulary. Table 2 shows the comparison of expressive vocabulary, grammar and phonology between the two age groups. Significantly greater percentiles were found in expressive vocabulary and grammar for children aged 5 to 6years in comparison with those aged 4 to 5years. Also, as expected, significantly lower "months" were found in expressive vocabulary and grammar for children aged 5 to 6years in comparison with those aged 4 to 5years. Phonology was similar for the two age groups. Comparison of expressive vocabulary, grammar and phonology by sex is shown in Table 3. No significant differences were found between males and female.

### Discussion

Our results show a significant deficit in phonology in Greek children with SLI, aged between 4 and 6years old. The mean phonological delay of the present sample of preschool Greek children with SLI is approximately 16months behind their chronological age. Bortolini & Leonard<sup>16</sup> have also found that children with SLI have serious limitations in phonological ability. The phonological deficits of children with SLI could be explained by Bishop's hypotheses<sup>5</sup> and specifically, by the first and second hypotheses claiming that speech output problems in SLI may be caused by the impaired process of converting underlying knowledge into a speech signal or may be due to impaired auditory perception.

When expressive vocabulary is compared to grammar in our sample, results are inconclusive, that is, there seems to be no subtype of preschool Greek children with SLI facing difficulties only with expressive vocabulary and grammar as has been suggested by Bishop et al.,<sup>6</sup> who proposed the subgroup of expressive disorder with or without receptive disorder in SLI.

When expressive vocabulary is compared to phonology, results are more conclusive as a subtype of SLI children emerges who face difficulties with expressive vocabulary and phonology, but not with grammar. This is in agreement with the subtype of articulation difficulties and expressive disorder with or without receptive disorder.<sup>6</sup>

**Table 1** Differences in expressive vocabulary, grammar and phonology as expressed in “months”

	Mean±SD	Median (IQR)
Expressive Vocabulary (months)1	3.3±4.9	0 (0 - 7)
Grammar (months)2	1.9±3.4	0 (0 - 6)
Phonology (months)3	16.4±7.4	18 (12 - 24)
P* 1 vs 2		0.096
P* 1 vs 3		<0.001
P* 2 vs 3		<0.001

\*Wilcoxon signed rank test

**Table 2** Comparison of expressive vocabulary, grammar and phonology by age group

	Age (years)		5-Apr	6-May	P
	Mean±SD	Median (IQR)	(N=11)	(N=11)	
Expressive Vocabulary (percentile)	23.6±16.1	20 (10-40)	69.1±22.6	80 (50 - 90)	<0.001*
Grammar (percentile)	42.7±33.5	20 (10-80)	68.2±19.4	70 (50 - 90)	0.041*
Expressive Vocabulary (months)	6.5±5.2	7 (0-12)	0.0±0.0	0 (0 - 0)	0.001**
Grammar (months)	3.8±4.0	6 (0 - 6)	0.0±0.0	0 (0 - 0)	0.005**
Phonology (months)	14.7±8.2	18 (6 - 24)	18±6.6	18 (12 - 24)	0.415**

\*Student's t-test \*\*Mann-Whitney test

**Table 3** Comparison of expressive vocabulary, grammar and phonology by sex

	Gender		Males	Females	P
	Mean±SD	Median (IQR)	(N=11)	(N=11)	
Expressive Vocabulary (percentile)	50.9±28.4	50 (20-80)	41.8±32.4	30 (20 - 80)	0.493*
Grammar (percentile)	62.7±24.1	60 (50-90)	48.2±34	60 (10 - 80)	0.261*
Expressive Vocabulary (months)	3±5.3	0 (0-8)	3.5±4.7	0 (0 - 7)	0.594**
Grammar (months)	0.5±1.8	0 (0-0)	3.3±4.1	0 (0 - 6)	0.057**
Phonology (months)	14.7±7.3	18 (12-18)	18±7.6	18 (12 - 24)	0.308**

\*Student's t-test \*\*Mann-Whitney test

When grammar is compared to phonology, results support a distinct subtype of SLI children, who experience grammatical and phonological deficits, but their expressive vocabulary is intact. This last subtype of preschool Greek children with SLI is in line with the findings of Conti-Ramsden et al.,<sup>10</sup> regarding cluster 3. According to these authors, cluster 3 is represented by children with adequate expressive vocabulary, but weaknesses in all other areas. Furthermore, syntactic and phonological impairments have been found in the study of Joanisse & Seidenberg.<sup>17</sup>

When comparing the two age groups, that is, the younger group (4 to 5year olds) with the older group (5 to 6year olds), the younger age group seems to generally show greater difficulties in expressive vocabulary and grammar than the older group. No significant differences were found in phonology between the younger and the older group. This is in accordance with the results of Conti-Ramsden & Botting,<sup>11</sup> who found that many children had changed their profile one year after initial testing and were placed in a different cluster from the one they were in one year earlier. Specifically, the older group of preschool Greek children with SLI has adequate semantic and grammatical skills, but experiences difficulties with phonology. These findings support the study of Van Daal et al.,<sup>12</sup> who suggested a subtype of children with SLI named speech production subtype and the study of Bishop et al.,<sup>6</sup> which proposes a subtype of children with SLI having articulation difficulties with or without receptive disorder.

Finally regarding gender, no important findings have been found,

but there is a trend for girls with SLI to have more grammatical difficulties than boys as they become older (between 5 and 6years old) in comparison to the younger age group (between 4 and 5years old). According to Tomblin et al.,<sup>7</sup> SLI is a more prevalent condition among girls, while Robinson<sup>18</sup> has argued that it is more common in boys. Whitehouse<sup>19</sup> claims that familial aggregation of SLI predominates in boys rather than girls.

## Conclusion

Some subtypes of SLI have been recognized in our sample, but not all subgroups that have been found in English speaking children with SLI. This could be explained by the small size of our sample or by the special features of the Greek language. Greek phonology seems to be the most defective area of this sample of children with SLI, which may mean that it is more complicated and harder for children to develop than in other languages. Phonology appears to be the most robust clinical marker for preschool Greek children with SLI.

Another important clinical implication of the present study concerns the possibility that a preschool Greek child with SLI may experience more than one linguistic deficit and that some linguistic areas may be more impaired than others.

The results provide evidence for a view that complex, compensating and restricting factors are present with language acquisition in children with SLI. There seem to be different SLI clusters, which can vary

and change over time within the same child. Therefore, children's speech and language services should assess SLI children on a regular basis, tailoring the speech and language therapy programmes to the children's needs. More studies, with larger samples, are required in order to ascertain specific clusters in the Greek language, which would aid the better understanding, assessment and intervention of children with SLI.

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## Conflicts of interest

Author declares there are no conflicts of interest.

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