Assessment Protocol for Children with Specific Language Impairment

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Abstract

The purpose of this study was to develop an assessment protocol for children with specific language impairment (SLI). The test battery included Kannada language test, Reading readiness test, Kannada articulation test and Test of pragmatic skills administered on fifteen subjects (12 males and 3 females). The subjects were selected on exclusionary criteria given by Leonard (1998). The present findings revealed that all fifteen children were having low performances in all domains of the language which includes phonological, syntax, semantic, morphological deficits and low articulation ability. However, only 40% children performed poorly in pragmatic skills but no definite conclusion can be drawn as the group was not homogeneous.

Keywords: SLI, Assessment Protocol, Linguistic Deficits

Introduction

Children with specific language impairment (SLI) appear to be developing normally in all respects except for their receptive and/or expressive language skills. Although they demonstrate normal intelligence, normal hearing, no evidence of emotional problem and are free from neurological disorders such as cerebral palsy, seizure disorders. These children are significantly delayed in acquiring multiple aspects of language, and deficits including grammatical morphology, phonology, syntax, lexicon and pragmatic skills (Joanisse & Seidenberg, 2003). Children with SLI exhibit other types of deficits that extend beyond language including problem with working memory (Montgomery, 1995), visual imagery (Johnston & Weismer, 1983) and speech perception (Tallal & Piercy, 1974).

Over the past two decades attempts were made to classify or subgrouping of language impairment in children. Aram & Nation (1975) sub-grouped developmental language impairment into six viz. repetition strength, nonspecific formulation-repetition deficits, phonologic, comprehension-formulation-repetition, comprehension deficits and formulation-repetition deficits. Wolfus, Moscovitch & Kinsbourne (1980) classified SLI into two groups, the first having deficits in phonology and syntax (the production type) and the second with global deficits in production and comprehension type.

According to Rapin & Allen (1983, 1987), SLI can be sub-grouped into verbal dyspraxia, phonological programming deficit syndrome, phonologic-syntactic deficit syndromes, lexical–syntactic deficit syndrome, semantic–pragmatic deficit syndrome and verbal auditory agnosia. However, DSM-IV (American Psychiatric Association, 1994) classified language impairment in children and does not use the term SLI but includes two disorders that together cover much of the same topography, i.e. expressive language disorders and mixed expressive receptive language disorders.

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In 1996, Rapin summarized subgroups of SLI as reported by Rapin and Allen (1983, 1987) into expressive language disorders, expressive–receptive language disorders and higher order processing disorders. Conti-Ramsden, Crutchely & Botting (1997) studied a group of 242 children having language impairment, supported Rapin & Allen's (1983, 1987) classification and they sub-grouped SLI into only five categories, leaving out verbal auditory agnosia.

Bishop (2000) revised Rapin and Allen's notion of semantic-pragmatic deficit disorder by describing SLI children as having pragmatic disorder too. He classified SLI into verbal dyspraxia, phonologic programming deficit syndrome, phonologic-syntactic deficit syndrome, lexical–syntactic deficit syndrome, semantic–pragmatic deficit syndrome and verbal auditory agnosia.

This difference in opinion regarding the cardinal language deficits in SLI has lead to no consensus on the use of a protocol with standardized language tests.

Need for the study:

As such there is no test battery to diagnose children with SLI. Hence, the present study was taken up to develop and standardize a test protocol in the Indian context.

Aim of the present study:

- To ensure appropriate assessment and diagnosis of children with SLI using test battery approach.
- To develop and refine existing framework for subgrouping of SLI in an Indian context.

Method

Subjects: To collect the data fifteen subjects were selected based on exclusionary criteria given by Leonard (1998). The children were in the age range of 3 to 5 years (12 male and 3 female). These children were from urban monolingual Kannada speaking background. They reported to All India Institute of Speech and Hearing (AIISH) with a complaint of delayed onset of speech and language and no evidence of serious neurological deficits, behavioral problems, or hearing problems.

Tools:

Following tests were administered to aid in assessment and subgrouping of SLI:

1. Kannada Language Test (KLT) (Project by RRTC & AYJNIHH, 1990)
2. Reading Readiness Test (Devaki Devi, 1987) Subsections
3. a) Vocabulary test b) Auditory Discrimination task
4. Test of Articulation in Kannada (Babu, Rathna & Bettageri, 1972)
5. Pragmatic Abilities Questionnaire (Anjana, 1999)

Procedure: A detailed case history was taken for all the fifteen subjects who reported to AIISH, Mysore. The case history included medical history, birth history, behavioral history and deficits of speech and language development.

Receptive and expressive language level was elicited with the help of Kannada Language Test. Their vocabulary, articulation, auditory discrimination and pragmatic skills were also elicited with the help of the test battery. In addition their hearing sensitivity was

conventionally screened with appropriate audiological tools like pure tone audiometry, BSERA and BOA. Non-verbal Intelligence was obtained by clinical psychologist with the help of Developmental Screening Test (DST, Bharath Raj, 1977). All the fifteen children were found to be having an IQ of 90 or above. The language test battery was administered in the clinical set-up.

Scoring: The responses were recorded on a score sheet provided in the test material. An appropriate marking was done based on criteria was given in each of the test materials.

Statistical Analysis: The mean and standard deviation of the scores in individual test was calculated. The t-test was done in order to find out the significance of difference between the mean of experimental data and standardized normative data.

Results and Discussion

Data was subjected to a statistical analysis. Mean scores and standard deviations of present study was compared with normative values given for urban children in Kannada language test and Reading readiness test. A t-test was used to find the significance of difference between normative values and present study. Results are discussed as follows:

I. Kannada Language Test

1. Semantic Receptive and Expressive skills

The present study shows Semantic receptive and expressive scores in Kannada language test.

Table1: Mean, SD and t-values of semantic receptive and expressive scores in the KLT

Age range (years)	Measures	Receptive			Expressive		
		Exp. group	Normative group	t-value	Exp. group	Normative group	t- value
3-3.6	Mean	8.2	23	5.10*	3.4	13.9	3.91*
	SD	1.09	6.32		1.51	5.81	
3.6-4	Mean	11.2	22.2	4.76*	5.8	9.3	1.42NS
	SD	2.58	4.77		3.56	4.90	
4.-4.6	Mean	12	26.15	5.40*	6.4	17.15	4.05*
	SD	3	5.41		2.51	5.60	

Maximum score: *p < 0.01 NS: not significant Semantic receptive = 36, Semantic expressive= 30

The results show Mean, SD and t-values of semantic receptive scores and expressive scores of present study. The t-values revealed no significant difference of expressive scores of age range between 3.6-4 years compared to normative group.

2. Syntax receptive and expressive skills

Table 2 shows finding of present study receptive and expressive scores of syntax in Kannada Language test. It shows syntax scores of receptive and expressive of experimental and normative group.

Table 2: Mean, SD and t-value of syntax receptive and expressive scores in KLT

Age range (years)	Measure	Receptive			Expressive		
		Exp. group	Normative group	t- value	Exp. group	Normative group	t-value
3-3.6	Mean	3	15.3	9.4*	0.6	7.35	3**
	SD	2.12	2.06		0.54	4.95	
3.6-4	Mean	8.2	14.95	2.59**	2.2	6.75	3.58*
	SD	3.70	5.16		2.58	2.21	
4.-4.6	Mean	4.8	20.4	5.25*	0.4	6.45	2.68*
	SD	3.27	6.17		0.54	4.94	

Maximum score: * p< 0.01 ** p<0.05 Syntax receptive = 33, Syntax expressive = 33

Semantic and syntax skills

Scores of semantic and syntax skills in present study of KLT are as shown below.

Table 3: Mean, SD and t-value of Semantic and Syntax scores of KLT.

Age range (years)	Measure	Semantic scores			Syntax scores		
		Exp. group	Normative group	t-value	Exp. group	Normative group	t-value
3-3.6	Mean	11.6	36.9	4.81*	4.4	26.65	4.74*
	SD	2.51	11.59		2.88	10.26	
3.6-4	Mean	17	31.5	3.21*	10.4	20.8	3.31*
	SD	5.87	9.26		6.23	5.64	
4.-4.6	Mean	18.4	43.3	5.11*	5.2	26.85	4.87*
	SD	3.78	10.54		3.7	9.58	

Maximum score: * p < 0.01 Semantic scores = 66, syntax scores = 66

The t-value from Table 3 revealed significant difference between normative value and present findings of semantic skills and syntax skills in Kannada language test.

The table 4 shows statistical relation between semantic and syntax skills of present data.

Table 4: Mean, SD and t-value of experimental group of semantic and syntax skills.

Age range (years)	Measure	Semantic score	Syntax score	t-value
3-3.6	Mean	11.6	4.4	4.23*
	SD	2.51	2.88	
3.6-4	Mean	17	10.04	1.87**
	SD	5.87	6.23	
4.-4.6	Mean	18.4	5.2	5.59*
	SD	3.87	3.7	

* p < 0.01 ** p < 0.10

The obtained t-value revealed significance of difference between these two domains and mean scores of semantics are higher than those of syntax. From above findings it suggests that children with language deficits are found to have better performance in semantic skills compared to syntax skills. This finding is an agreement with Klee (1989) who revealed that sentences produced by SLI children were not age appropriate. Leonard, Miller

& Gerber, (1999); Joanisse & Seidenberg (2003) suggested that children with SLI have difficulty comprehending specific types of syntactic relationship such as reversal passives and bound pronouns and reflexive.

3. Receptive and expressive skills of language

Receptive and expressive language scores were obtained from Kannada language test. Scores were compared with normative values of standardized Kannada language test (Shyamala, Vijayashree & Jayaram, 2004).

Table 5: Mean, SD and t-value of receptive and expressive language of Kannada

Age range (years)	Measure	Receptive scores			Expressive scores		
		Exp. group	Normative group	t-value	Exp. group	Normative group	t- value
3-3.6	Mean	11.4	45.2	6.97*	4.6	23.2	3.97*
	SD	2.88	10.64		1.67	10.38	
3.6-4	Mean	19.4	52.1	8.15*	8	28.9	4.84*
	SD	5.55	8.12		6.08	8.72	
4.-4.6	Mean	16.6	52.75	8.9*	6.2	31.1	6.27*
	SD	5.5	8.26		1.92	8.76	

Maximum score: *p < 0.01 Receptive = 69, Expressive = 63

Table 5 shows mean and SD of receptive language skills. Mean values of receptive skills and expressive skills were compared with normative values. The t-value shows significant difference between these two skills. The research suggests that SLI children are having better receptive language than the expressive language. The present findings correlated with the studies reported by Leonard (1991) and Nippold & Schwarz (2002).

4. Overall Language skills

Table 6: Mean, SD and t-value of total scores for KLT

Age range (years)	Measure	Exp. group	Normative group	t-value
3-3.6	Mean	16	67.35	5.34*
	SD	4.52	21.14	
3.6-4	Mean	27.4	81	6.98*
	SD	11.54	15.28	
4.-4.6	Mean	23.6	83.85	8.15*
	SD	5.64	16.02	

Maximum scores = 132 * p < 0.01

Mean and SD value of each group was compared with normative values. The t-value shows significant difference between normative scores and experimental data. The present finding correlated with Stark & Tallal (1981) with reference to diagnosis of children with SLI. They remarked that the language scores of SLI children should show at least 12 months age difference between compared to that of chronological age or mental age.

II. Reading Readiness Test

Vocabulary and Auditory discrimination skills:

Vocabulary and Auditory discrimination test was administered on each child. The obtained results were compared with normative data. In the vocabulary test children were

asked to point to the pictures as named by the tester. For auditory discrimination minimal pairs of words were presented and children were instructed to point to the picture in same sequence of words presented by the tester. The obtained mean scores and SD are given in Table 7.

Table 7: Mean, SD and t-value of Vocabulary and Auditory discrimination in Reading readiness test.

Age range (years)	Measure	Vocabulary			Auditory discrimination		
		Exp. group	Normative group	t- value	Exp. group	Normative group	t-value
3-4	Mean	13.2	14.4	0.64NS	4.8	37.2	11.4*
	SD	4.9	5		7.82	7.5	
4-5	Mean	17	18.1	0.69NS	3.8	43.3	10.28*
	SD	1.41	3.5		4.14	8.4	

NS: not significance * $p < 0.01$ Vocabulary = 22, Auditory Discrimination = 68

Table 7 shows children involved in this present study were found to be having good receptive vocabulary abilities. The t-value of vocabulary skills shows no significant difference between experimental mean scores and normative mean scores. These findings suggest that these children were having age appropriate vocabulary but mean scores of auditory discrimination and t-value indicates significance of difference between normative mean scores and experimental mean which is indicative of auditory perceptual deficits in these children. Bird & Bishop (1992) revealed that children with SLI were having poor auditory discrimination. Rvachew, Ohberg, Grawburg & Heyding (2003) revealed age appropriate vocabulary in children with moderately or severely delayed expressive phonological skills but significant poor performance on auditory discrimination skills compared to their normally developing peers.

III. Test of Articulation in Kannada

Articulation abilities:

Kannada articulation test (KLT) was administered on 11 children. For the rest of four subjects (two children from each age ranges between 3-3.6 and 3.6 to 4 years) KLT could not be administered as these children did not have any verbal language.

Table 8: Articulation errors in different age groups on Kannada articulation test.

Age range (in years)	No. of children	Target sounds Vs Errors sounds
3 – 3.6 years	3	Ch /s, t/t l/r, distortion of k, w, d
3.6 – 4 years	3	Ch/s, t/t, s/S, d/d, i/j, r/r, b/v, omission, r, t
4 – 4.6 years	5	s/S, ch/s, l/r, th/f clusters, blending absent

As shown in the Table 8 children were found to be having difficulty in articulation ability. Misarticulated sounds were compared with developmental articulation skills in normally developing children given by Tasneem Banu (1977). The children were also having poor auditory discrimination scores in Reading readiness test which revealed that children were having phonological deficits. This findings support the results of Conti-Ramsden, Crutchely & Bottig (1997); Bishop (2000); Rvachew, Ohberg, Grawburg & Heyding (2003).

IV. Pragmatic abilities Questionnaire

The questionnaire on pragmatic skills developed by Anjana (1999) was given to each child's parents. The child's parents were instructed to rate the child's performance in three scales i.e. most frequently occurring, frequently occurring and "never" responses. The responses were subjected for calculating frequency of responses in percentage.

Table 9: Children's performance on pragmatic skills Questionnaire

Parameters	Most frequent Response in %	Frequent response in %	Never occur response in %
Attention seeking	60.40	23.10	16.60
Request object	67.50	20.00	12.50
Request action	34.50	22.00	43.75
Request Information	67.00	15.00	19.00
Naming	31.25	43.75	25.00
Greeting	75.00	25.00	0.00
Responding	56.00	25.00	19.00
Protest	50.00	12.50	37.50
Comment	62.5.	18.75	18.75
Turn taking	52.00	23.00	23.00
Topic exchanged	41.00	28.00	31.00
Conversational repairs	35.00	31.00	34.00
Total percentage	52.70	23.94	23.35

Table 9 shows scattered scores in the questionnaire of pragmatic skills. These children obtained fewer scores in conversation repairs, request action, topic exchange and naming. This result shows that children were having pragmatic deficits as well. The above findings correlate with finding reported by Rapin & Allen (1983) and Tomblin, Hafemant & O'Brien (2003). Rapin & Allen (1983) also reported normal or relatively intact grammar but inadequate conversational skills, selecting inappropriate words, poor maintenance of topic. Adams & Bishop (1989) pointed that SLI children too have pragmatic deficits and are not homogeneous group.

V. Cluster identification for subgrouping

All fifteen subjects were investigated for the feasibility of subgrouping based on the present test battery.

Table 10 shows the performance of these children on different domains. As can be seen all 15 children i.e. 100% failed to perform in articulation test, auditory discrimination task and Kannada language test. Twelve children i.e. 80 % achieved fair scores in the receptive vocabulary test, and six children i.e. 40% failed on pragmatic skills. Based on performance of the each child in each domain of language skills these children were found to have generalized low performance in all tasks. However, only 40% children had pragmatic deficits clearly indicates pragmatic deficits may not be prominent among SLI children. The present findings do not support subgrouping of SLI as reported by Rapin & Allen (1987). However, characteristics of SLI children in the present study were comparable to the 'generalized low performance' group in Aram & Nation (1975) classification; and the 'global deficits in production and comprehension' type of Wolfus, Moscovitch & Kinsbourne (1980) classification.

Table 10: Clusters of language features based on the performance in each domain.

Age in years	Skills	Phonology	Lexical	Semantic	Syntax	Pragmatic
3-3.6 years	1.	–	1	0	0	1
	2.	–	1	0	0	1
	3.	0	0	0	0	1
	4.	0	1	0	0	0
	5.	0	0	0	0	0
3.6-4 years	6.	–	0	0	0	0
	7.	–	1	0	0	1
	8.	0	1	0	0	0
	9.	0	1	0	0	1
	10.	0	1	0	0	1
4-4.6 years	11.	0	1	0	0	1
	12.	0	1	0	0	0
	13.	0	1	0	0	0
	14.	0	1	0	0	1
	15.	0	1	0	0	1

(Note: 0, indicates children who failed to perform in each domain, – indicates children not tested and 1 indicates children who performed positively in language domains).

Further subgrouping however was not feasible in the small sample studies. This needs to be further explored. This may be because of the differences observed with respect to number of subjects and the age range in the present study with the above studies. The investigation reported by Aram & Nation (1975) studied 47 children with the mean age of 5 years and Rapin & Allen (1987) had 242 children with the mean age 7 years, while the present study had only 15 children with the mean age of 3.9 years.

To conclude, all fifteen children were found to have deficits in overall language skills including receptive, expressive skills of language and subtests of semantic and syntactic skills. They also had deficits in articulation abilities and auditory discrimination task. The receptive skills are found to be better than expressive skills of language. The present finding suggests the replication of this study on larger population of specific language impaired children.

Implications

- The test battery helps us to arrive at a detailed assessment profiling, identification and diagnosis of children with SLI and thus providing directions to its management
- The study adds to the clinical research concerns specifically with respect to identification of possible clinical markers of SLI.

References

American Psychiatric Association, (1994). Diagnostic and statistical manual of mental disorders (4th Indian edition,1995). (DSM-IV). Delhi: Jaypee Brothers.

Anjana C. R, (1999). Pragmatic abilities of autistic and normal children-A comparative study. *Unpublished Master's Dissertation*, Mysore: University of Mysore.

Aram, D. M., & Nation, J. E. (1982). *Child language disorders.* London: C.V. Mosby Company.

Babu, R. M., Rathna, N. & Bettageri, R. (1972). Test of articulation in Kannada. *Journal of All India Institute of Speech and Hearing,* 3, 7-19.

Bharath Raj (1977). *Developmental screening test for mental ability.* Mysore: Swayam Siddha Publication.

Bird, J. & Bishop, D. (1992). Perception and awareness of phonemes in phonologically impaired children. *European Journal of Disorders of Communication*, 27, 289-311.

Bishop, D. (2000). Pragmatic language impairment: A correlate of SLI, a distinct subgroup, or part of the autistic continuum? In D. V. B. Bishop and L. B. Leonard (Eds.). *Speech and Language Impairment in children: Cause, Characteristics, Intervention and Outcome* (pp.-99-113) Hove: Psychology Press

Conti-Ramsden, G., Crutchley, A. & Botting, N. (1997). The extent to which psychometric tests differentiate subgroups of children with SLI. *Journal of Speech, Language, and Hearing Research*, 40, 765-777.

Devaki Devi, (1987). *Reading readiness test.* Unpublished Master's Dissertation, Mysore: University of Mysore.

Joanisse, M. F. & Seidenberg, M. S. (2003). Phonology and syntax in specific language impairment: Evidence from a connectionist model. *Brain and Language*, 86, 40-56.

Johnston, J. & Ellis Weismer, (1983). Mental rotation abilities in language disordered children. *Journal of Speech and Hearing Research*, 26, 397- 4003.

Kelly, D. J. (1998). A clinical synthesis of the "late talker" literature: Implications for service delivery. *Language, Speech and Hearing Services in Schools*, 29, 76-84.

Leonard, L. B. (1998). *Children with specific language impairment.* Cambridge, MA: The MIT Press.

Leonard, L. B. (1991). Specific language impairment as a clinical category. *Language, Speech, and Hearing Services in Schools*, 22, 66-68.

Leonard, L. B., Miller, C. & Gerber, E. (1999). Grammatical morphology and the lexicon in children with specific language impairment. *Journal of Speech and Hearing Research,* 42, 678-689.

Montgomery, J. (1995). Sentence comprehension in children with specific language impairment: The role of phonological working memory. *Journal of Speech and Hearing Research*, 38, 177-189.

Nippold, M. A. & Schwarz, I. E. (2002). Do children recover from specific language impairment? *Advances in Speech-Language Pathology*, 4 (1), 41-49.

Rapin, I. (1996). Developmental language disorders: A clinical update. *Journal of Child Psychology and Psychiatry*, 37, 643-655.

Rapin, I. & Allan, D. (1983). *Developmental language disorders: Nosologic considerations.* In U. Kirk (ed.). Neuropsychology of language, reading and spelling (pp.155-184). New York: Academic press.

Rapin, I. & Allen, D. (1987). *Developmental dysphasia and autism in preschool children: characteristics and subtypes*. In J. Martin, P. Fletcher, P. Grunwell, & D. Hall (Eds.), Proceedings of the First International Symposium on Specific and Language Disorders in children (pp.20-35). London: AFASIC.

Regional Rehabilitation Training Center, Chennia & Alli Yavar Jung National Institute of Hearing Handicapped, Mumbai (1990). Kannada language test.

Rvachew, S., Ohberg, A., Grawburg, M. & Heyding, J. (2003). Phonological awareness and phonemic perception in 4-year-olds children with delayed expressive phonology skills. *American Journal of Speech-Language Pathology*, 12, 463-471

Shyamala, K. C., Vijayshree & Jayram, M. (2004). *Standardization of Kannada language test*. Fund Project, All India Institute of Speech and Hearing, Mysore.

Stark, R. E. & Tallal, P. (1981). Selection of children with specific language deficits. *Journal of Speech and Hearing Disorders,* 44, 114-122.

Tallal, P. & Piercy, M. (1974). Developmental aphasias: Rates of auditory processing and selective impairment of consonant perception. *Neuropsychologia*, 12, 83-93.

Tasneem Banu (1977). Articulation acquisition in kannada: A study of normal children. Unpublished Master's Dissertation, Mysore: University of Mysore.

Tomblin, J. B., Hafemant, L. L. & O'Brien, M. (2003). Autism and autism risk in siblings of children with specific language impairment. *International Journal of Communication Disorders*, 38(3), 235-250.

Wolfus, B., Moscovitch, M. & Kinsbourne, M. (1980). Subgroup of developmental language impairment. *Brain and Language*, 10, 152-171.