Computerised Linguistic Protocol for Screening (CLiPS)

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Abstract

The present study is aimed to develop a Computerized Linguistic Protocol (in Kannada) for Screening children. The study also aimed to trace the developmental patterns on various linguistic aspects in children. The gender difference, if any, in language acquisition was also analysed. Sixty normal children in the age range of 3-8 years were selected for the study. Six children (3 male and 3 females) in each half-yearly period were tested across 10 age groups. The data was subjected to Mean, Standard Deviation, t-test (paired), One-way ANOVA with Duncan's multiple range test and item analysis. The results of the study revealed a clear developmental pattern in language acquisition by children in the age range of 3-8 years. Comprehension abilities were better than the expression abilities across all the age groups under study. Acquisition of semantics was earlier to that of syntax. There was no significant difference in the performance of boys and girls on CLiPS.

All living creatures communicate; only humans exchange information using a code that we call language. Language is the knowledge of a code for representing ideas about the world through a conventional system of arbitrary signals for communication. Language is a complex combination of several component rule system and it can be divided into three major components: Form, Content and Use. 'Form' includes syntax, morphology and phonology-those components that connect sounds or symbols with meaning, content encompasses meaning or semantics and the 'use' comprises 'pragmatics' (Bloom & Lahey, 1978).

Language disorder is a term that represents a heterogeneous group of either developmental or acquired disabilities principally characterized by deficits in comprehension, production and/or use of language.

Identification of language disorders becomes important for intervention purposes. Identification of language disorders is generally done by employing screening tests. Screening is typically used when more elaborate methods become impractical from the perspective of both time and money. Every child with a risk of language disorder should be screened.

Screening is important for the early intervention which reduces further complications of the child. Screening can be formal or informal and that formal screening can be either norm-referenced or criterion-referenced. Norm-reference screening compares the child's performance to that of a normative group of the same age or grade. Criterion-reference measure uses a criteria for normal performance to which the clinician compares a given child's performance. A screening test should also provide description of development of the test, content, administration, scoring, reliability and validity of the test.

A variety of tests and scales developed in the West are generally available for screening purposes. These Western tests cannot be used in the Indian context because of the cultural and the linguistic variability and absence of norms on Indian population.

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To overcome these lacunae, there are a few tests developed in India. They are:

a. A Screening Picture Vocabulary Test in Kannada (KPVT) - Sreedevi (1988)
b. Screening Test for the Acquisition of Syntax in Kannada (STASK) Vijayalakshmi (1986)
c. A Syntax Screening Test in Tamil (SST) - Sudha (1981)

Need for the study

Owing to the paucity of the screening tests or measures, we have a great setback in our screening or identification of children with language delay/disorder. And there is great mismatch between the number of professionals and the number of clients who are in need of services, the former being too low, a user-friendly screening protocol that is easily accessible by testers is devised with the aim of deprofessionalizing the screening program. There is need for a screening protocol, which is user-friendly, easily accessible by examiners and the screening procedure that is de-professionalised.

Objectives of the study

a. To develop the Computerized Linguistic Protocol for Screening children (in Kannada) [CLiPS].
b. To check for the developmental trend if any on various linguistic aspects.
c. To find out the gender difference, if any, in language acquisition.

Method

The objective of the study was to develop a Computerized Linguistic Protocol (in Kannada) for Screening children (CLiPS). The study also aims to trace the developmental patterns on various linguistic aspects in children. The gender difference, if any, in language acquisition was also analyzed.

The screening test is developed by selecting pictures from the project "production of language training material in major Indian languages", funded by UNICEF, which is published by Action Aid as "With Little Bit of Help- Early Language Training Manual".

This Early Language Training Manual (Karanth, Manjula, Geetha & Prema, 1999) was developed as an indigenous teaching materials, at affordable prices, for those who are identified as having delayed language acquisition. The instruction manual developed is designed to meet this need and serve as core teaching material in ten Indian languages spoken across India.

The material for the language training consists of 664 picture cards, designed to teach/elicit a variety of language forms, meaning and use. The pictures consist of simple line drawings true to the Indian cultural context. The requirement of children and adults, normal and handicapped, both from rural and urban areas have been considered in designing the pictures.

These pictures were field tested by field-investigators in ten languages in the age range of 3-12 years, adults (literate and illiterate) and children with delayed speech and language. This was done for assessing the suitability of the pictures to the Indian population. Based on the field-testing results, few pictures were eliminated and some were modified. The entire project was based on the Linguistic Profile Test (LPT) [Karanth, 1984].

The present study was pursued along the following steps:

I) Development of the Computerized Linguistic Protocol for Screening (CLiPS)

i. Selection of pictures

The field-tested data of the UNICEF project was examined to choose pictures for developing the screening protocol. The pictures, which elicited 75%-100% responses from the subjects during earlier field-test, were selected and the pictures which were unambiguous and descriptive enough (as mentioned by earlier field tester) were selected. Thus, the total number of pictures selected, which are distributed category-wise is 127.

ii. Computerization of screening protocol

The selected pictures, which were equally distributed among different categories of semantics and syntax were scanned individually and stored in compact disc, which was loaded on to a laptop computer for presentation during screening. The pictures were either single, pairs or in fours depending on the purpose for which they are presented. Along with the pictures the instruction manual was prepared with specific instructions for different categories of language.

iii. Test items

The test items comprises of a set of four pictures (single picture, as well as, set of 3-4 picture depending on the target parameter) containing black and white line drawings in each of the categories. The various categories are:

1. Lexical Categories
2. Antonym
3. Polar Questions
4. Syntagmatic Relationship
5. Paradigmatic Relationship
6. Semantic Similarity
7. Semantic Anamoly
8. Semantic Contiguity
9. Plurals
10. Affirmative-Negative Form
11. Interrogatives
12. Person-Number-Gender
13. Transitive
14. Intransitives
15. Causatives
16. Conditional Clauses
17. Conjunctions
18. Comparatives
19. Quotatives
20. Case Markers
21. Tenses
22. Participial
23. Construction

The pictures in each category are evenly distributed, so that the comprehension and expression tasks are given equal importance. The test material is given in a compact disc and the sample pictures are given in the Appendix- A.

II) Administration of the protocol

i. **Subjects:** 60 normal subjects in the age range of 3-8 years were taken for the study. Six subjects (3 males and 3 females) in each half-yearly age range were tested across 10 age groups. The age groups are:

Table 1: Age groups of subjects

Group code	Age Groups	Number of subjects
3I	3.1-3.6 years	6
3II	3.7- 4 years	6
4I	4.1- 4.6 years	6
4II	4.7- 5 years	6
5I	5.1-5.6 years	6
5II	5.7- 6 years	6
6I	6.1- 6.6 years	6
6II	6.7- 7 years	6
7I	7.1- 7.6 years	6
7II	7.7- 8 years	6
	Total	60

Criteria for subject selection:

1. Kannada speakers (either having Kannada as mother tongue or living in Karnataka and exposed to Kannada since birth).
2. No physical or sensory deformities.
3. Speech and language appropriate to the age as per the parents'/teachers' report.

ii. Procedure

a. Test environment

The subject was seated comfortably in a quiet-room. The investigator conversed with the subject to have rapport. Then, the pictures were presented on the screen of Laptop one at a time.

b. Design

The order of presentation of comprehension and expression task in a particular category was varied in such a way that every alternate subject in an age group was tested for comprehension and the other for expression, thus counterbalancing the tasks for comprehension and expression. Therefore, out of 6 subjects in each age group, 3 subjects had comprehension task to be performed first and other 3 subjects had expression task to be performed first. This counterbalanced design was adapted to see whether the performance of children differs when presented with comprehension or expression task.

c. Data

The subject was instructed according to the specific instructions (comprehension and expression separately) for different categories to respond appropriately (E.g. in Lexical item: what is this? for expression task). No subject was given any cues or prompted for response elicitation. The time taken for testing was different across age groups. While the younger age

group performed on an average within 60 minutes to 75 minutes, the older age group completed earlier i.e., about 30 minutes to 40 minutes on an average.

The responses were elicited by showing the pictures one after the other. The subject's responses were recorded on the scoring sheet. The subjects were provided reinforcement at the end of the testing.

iii. *Recording Responses*

The subjects' responses were scored as correct ($\checkmark$) when a target response was correct (E.g. 'Nurse' for the picture of 'Nurse') or equivalent response (E.g. 'Sister' for the picture of 'Nurse') is obtained and when there was an incorrect response it was recorded verbatim in the data entry format.

iv. *Analysis of the data*

The data was subjected to qualitative and quantitative analyses.

Results and Discussion

The aim of the present study is to develop the Computerized Linguistic Protocol for Screening children (in Kannada) and to trace the developmental pattern on various linguistic aspects. The data obtained was subjected to the following statistical analyses:

1. Mean and Standard Deviation (SD).
2. t-test (Paired).
3. One-way ANOVA (Duncan's multiple range test).
4. Item Analysis.

I) Mean and SD scores across ages

The raw scores of 60 children (three to eight years age) were complied. The Mean, Standard Deviation and t-values were computed and presented in Table 2. Table 2 indicates that the mean scores ranged from 73.50 to 138.16 for a maximum score of 140. The mean scores increased gradually from three years to eight years of age, by having reached almost maximum at the age of eight years. It indicates that the language development is almost complete by the age of eight years and later it reaches a plateau. This finding is well supported in the literature. Studies by Rukmini (1994), Sudha (1981), Sreedevi (1988), and Bhuvaneshwari (1993) support the above findings on language development, which report that there is a hierarchal development of language in children.
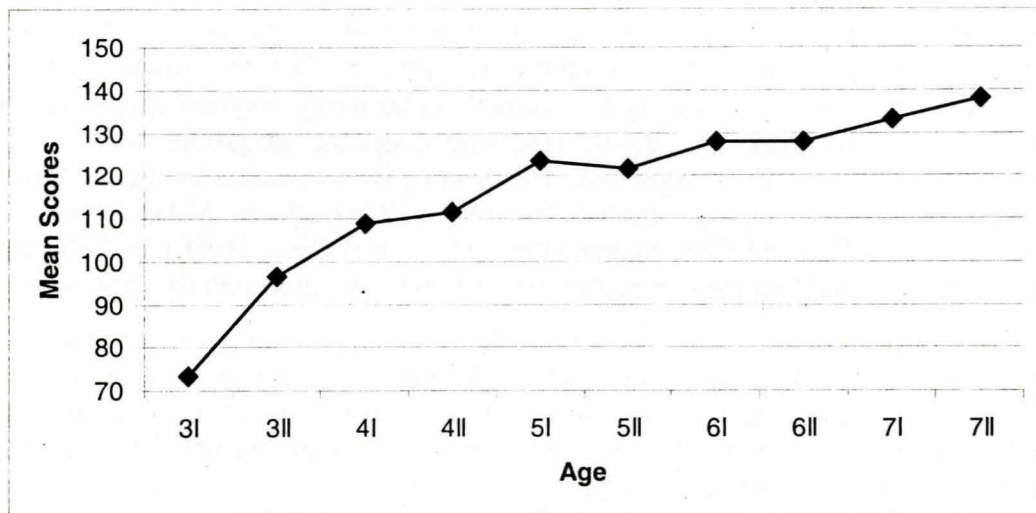
The SD was highest in the age groups 3II, 4I and 4II. This indicates that acquisition of language skills is not stable across children in these age groups. The lower SD in other age group indicates that the acquisition of the language skill is stable at the age group 7II. The Fig- 1 indicates the mean language scores across age groups, which shows the developmental trend.

II) Development of comprehension and expression

Although there is a developmental trend in language development, to check whether the same developmental trend is seen for both comprehension and expression task, the Mean, Standard Deviation and t-values on comprehension and expression tasks were calculated. Table- 3 and Fig-2 depicts the scores.
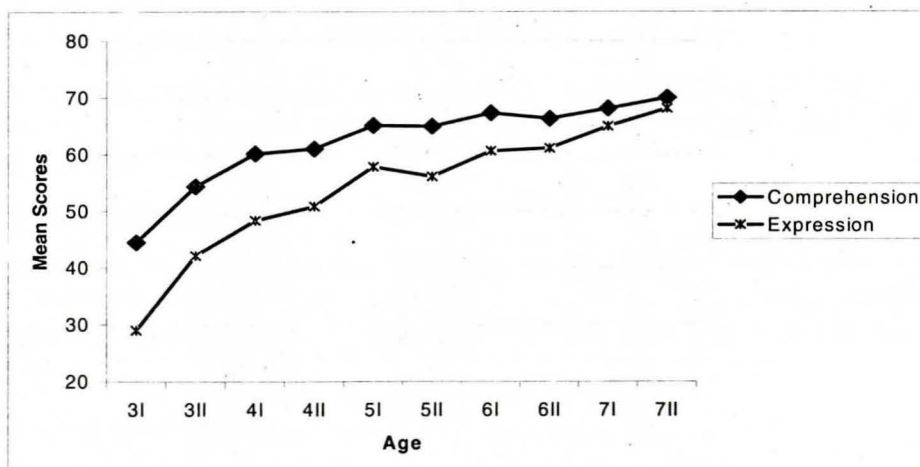
Table 2: Mean and SD scores according to ages

Age	Mean (Max=140)	SD
3I	73.50	5.70
3II	96.50	10.1
4I	109.00	11.7
4II	111.33	10.4
5I	123.50	6.26
5II	121.66	7.47
6I	128.00	7.02
6II	128.00	7.83
7I	133.16	4.48
7II	138.16	1.95

Fig 1: Mean scores across age groups

Table 3: Scores on comprehension and expression across age groups

Age	Compression		Expression		t-values	Sig
	Mean (Max=70)	SD	Mean (Max=70)	SD		(2-tailed)
3I	44.5	2.14	29.00	6.24	4.691	.005
3II	54.33	5.79	42.16	4.63	10.980	.000
4I	60.16	3.43	48.33	0.91	4.342	.007
4II	61.00	3.55	50.83	6.59	6.353	.001
5I	65.16	2.85	57.83	3.80	6.102	.002
5II	65.00	2.51	56.16	6.30	3.578	.016
6I	67.33	2.28	60.66	5.64	2.988	.031
6II	66.33	3.48	61.16	4.94	3.675	.014
7I	68.16	1.57	65.00	3.10	3.124	.026
7II	70.00	0.00	68.16	1.95	0.795	.462

Fig 2: Comprehension and expression scores across age groups

It was observed that the mean scores of comprehension were better than expression across all the age groups. However, the difference in performance on tasks was highest for lower age groups and least for highest age groups. The performance of children on comprehension task was relatively less variable compared to expression tasks as revealed by SD scores. The SD scores are almost decreasing across the age groups in comprehension and variable across ages in expression task. This finding is in agreement with the previous studies by, Menyuk, (1977); Shipley, Smith & Gleitman, (1978); Bloom, Miller & Hood, (1978); de Villers & de Villers, (1978); Sudha (1981); Vijayalakshmi, (1986) and Rukmini (1994). These authors found that the comprehension was always better than the expression.

The t-test also indicates significant difference in performance on comprehension and expression task in all age groups except at 7II, suggesting that by the completion of 7 years expression skills are almost equivalent to comprehension skills. But the mean scores did not reach maximum even at the highest age group which suggests that language development continues even after eight years of age.

III) Development of semantics and syntax

To check whether there is also a parallel development of both syntax and semantics, further analysis was taken up. The Mean, Standard Deviation and t-values of semantics and syntax are computed and given in Table- 4 and Mean scores are depicted in the Fig- 3.
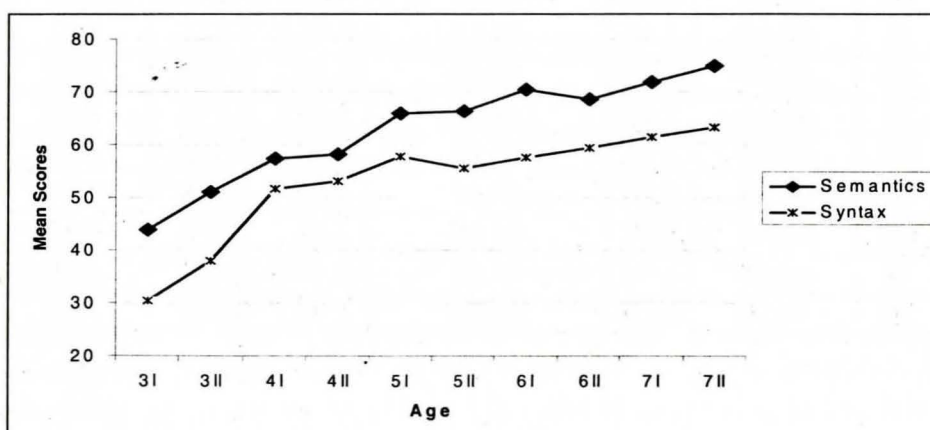
Figure 3: Mean scores of semantics and syntax

Table 4: Mean and SD of semantics and syntax

Age	Semantics		Syntax		t-values	Sig (2-tailed)
	Mean (Max = 76)	SD	Mean (Max =64)	SD		
3I	43.80	4.44	30.33	2.86	6.291	.001
3II	51.00	4.47	37.91	9.00	3.297	.022
4I	57.33	8.25	51.66	4.57	1.982	.104
4II	58.16	6.74	53.16	4.59	2.266	.073
5I	65.83	4.87	57.66	2.13	4.369	.007
5II	66.33	4.81	55.50	2.87	7.608	.001
6I	70.50	2.98	57.60	4.18	14.105	.000
6II	68.66	6.39	59.33	2.62	3.568	.016
7I	71.83	2.40	61.33	2.49	11.864	.000
7II	74.83	0.68	63.33	1.49	20.436	.000

It was observed that the mean scores across age groups were better for semantics in comparison to syntax. A gradual improvement in performance of the children in both semantics and syntax was observed. However, performance on semantics was always better than syntax across age groups.

Performance of children on semantic and syntactic tasks showed high variability and significant difference in all age groups except at 4II as measured through SD scores and t-test. The differential performance of children in semantics and syntax suggests that the underlying skills required to perform as the above tasks could be different. Rukimini (1994) found better scores for syntax than semantics. The results of the present study are not in support of the above.

IV) Language development in boys and girls

The third objective of the study was to see if there is any difference between boys and girls in the performance on CLiPS. Therefore, the Mean, Standard Deviation and t-values of boys and girls across age group were computed and given in the Table- 5. The Mean scores are depicted in the Fig- 4.
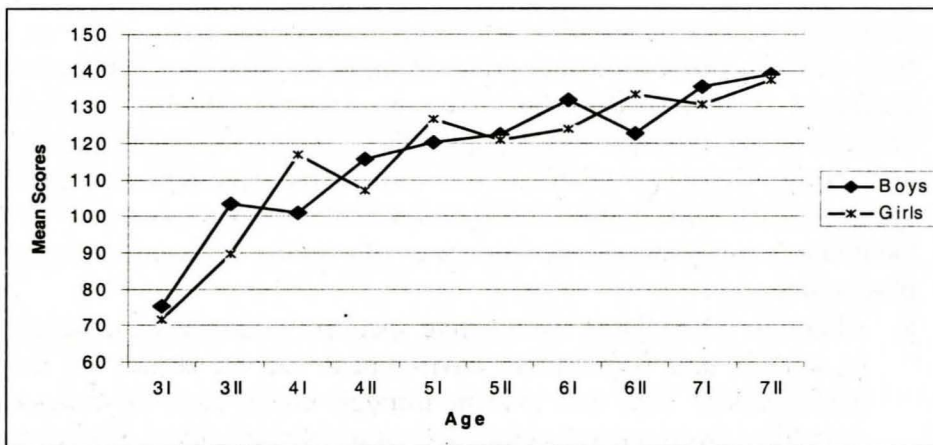
Fig- 4: Mean scores across boys and girls

Table 5: Mean and SD of boys and girls

| Age | Boys | | Girls | | t-values | Sig |
	Mean (Max = 140)	SD	Mean (Max= 140)	SD		(2-tailed)
3I	75.3	7.40	71.66	1.88	0.628	.594
3II	103.33	6.79	89.66	8.25	1.409	.294
4I	101.00	9.42	117.00	8.48	1.622	.246
4II	115.66	11.4	107.00	6.97	2.726	.112
5I	120.33	6.64	126.66	3.77	1.686	.234
5II	122.33	4.71	121.00	9.41	0.144	.899
6I	132.00	4.89	124.00	6.53	1.139	.373
6II	122.66	7.40	133.33	3.29	1.416	.293
7I	135.66	1.69	130.66	4.98	1.987	.185
7II	139.00	0.81	137.33	2.35	0.762	.525

The Mean scores indicated that boys performed better than girls in the age groups 3I, 3II, 4II, 5II, 6I, 7I, 7II and girls performed better than boys in the age groups 4I, 5I, 6II. The t-test indicates that there is no significant difference in performance between boys and girls in any of the age groups. This finding is in support of the previous study by Kathyayani (1984); O' Donnell, Griffin & Norris (1967); Bliss, Allen & Wrasse (1977) and Sreedevi (1988) who found no clear distinction in performance between the genders across various age groups. Bhuvaneshwari (1993) found that boys had higher Mean values than girls. This is contradictory to the literature that girls have better language ability than boys. Mc Carthy (1954) also reports that girls are better than boys in linguistic performance.

Conclusions

The results of the study are as follows:

1. Analysis of the group data indicated a clear developmental pattern in language acquisition by children in the age range of 3–8 years.
2. Comprehension abilities were better than the expression abilities across all the age groups under the study.
3. There was no significant difference in the performance of boys and girls on CLiPS.
4. Acquisition of semantics was earlier to that of syntax.
5. Item analysis of the screening protocol suggested that the CLiPS could be further shortened (Quick–CLiPS) (as given in Appendix-B) for quick screening of children in the different age groups. (The complete test with instruction manual and scoring sheet is available in CD form at the department of Speech-language sciences at All India Institute of Speech and Hearing).
6. Qualitative analyses of performance of children revealed some interesting observations:
   a. Although the children were native speakers of Kannada, exposure to English in schools and surrounding environment had an impact on their language performance. This was evident through errors such as code-mixing, code switching, over-generalization, derivation of code mixed words, etc.
   b. The low achievers, identified as those with language disorder did not name the specific lexical item. Rather, labeled the category head (E.g: Cloth for fork).

Such observations lead to a speculation as to whether such children who fail to name the specifics of lexical items, are at risk for language disorder? The observations, however, needs to be investigated further.

Implications of the study

1. CLiPS can be used as a screening tool to identify children with language disorder.

2. Since CLiPS can be administered with the help of computer, the procedure for screening can be made uniform across different clinical set-up.

3. The instructions for CLiPS can be easily translated into other languages and the pictures can be used to screen children who are non-Kannada speakers.

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