2-Word and Non-Word Repetition Test in Kannada

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 WORD COUNT
 9635

 CHARACTER COUNT
 41958

repetitic 2 scores across each of the syllable lengths; for the percentage of vowels and consonar 2 correct across different syllable lengths for both words and nonwords; and also for the percentage of different types of errors namely syllable substitutions, omissions and additions in both words and nonwords (see Appendix B). The results revealed that the accuracy of the repetition scores was better for words on the whole and at all syllable lengths compared to nonw 21s for both age groups and gender which can be attributed to the effect of lexical status. Further the children in the higher age group performed better on the repetition of words and nonwords than the children in the lower age group. This shows that as children grow their phonological working memory also matures. Their better performance could be attributed to the more proficient articulatory abilities and better subvocal rehearsal mechanism of the phonological loop which helps to actively maintain the to-be-repeat 1 'skeleton' of sub-lexical components (e.g., syllables, onsets-rimes) (Gather 11e & Baddeley, 1989). In general, the children in both the age groups performed better on the 2- and 3-syllable length nonwords than on 4- and 5-syllable length nonwords. This might be attributed to the lesser frequency of exposure of the children at this age to longer syllable length words.

Further the results indicated a significant difference between the performance of chil 20 of 4-5 and 5-6years age group on 2 and 3-syllable length words where in the performance of children in the higher age group was significantly better that that of the children in the lower age group. However, with respect to the repetition 2 nonwords, there was a significant difference between the children of the two age groups, on 3-, 4- and 5-syllable length nonwords. The results indicate that there is a greater development between age groups at 2 and 3 syllable length word level compared to the 4 and 5 syllable length word level. This indicates that the refining of the phonological working memory progresses in a step by step fashion from 2 and 3 syllable to 4 and 5 syllable level.

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Further the scores were computed and compared across children from different age groups representing different socio-economic status (SES) which did not reveal any significant group differences on the Kruskal Wallis test for any of the parameters. The effect of gender was also not significant containing of the parameters of WNRT-K. The mean, SD values, chisquare and level of significance values have been depicted in Table 4.1.

Syllable	SES		4-:	5yrs			5	-6yrs	
length		Mean	SD	Chi square (df, 2)	p values	Mean	SD	Chi square (df, 2)	p values
WA2sy	1	9.93	0.26			10.00	0.00		
	2	9.78	0.42	2.49	0.29	9.91	0.29	2.03	0.36
	3	9.82	0.41			9.97	0.18		
WA3sy	1	9.39	0.88	2.03	0.36	9.74	0.56	2.74	0.25
		9.41	0.80			9.57	0.73		
	23	9.64	0.67			9.87	0.35		
WA4sy	1	9.61	0.88	3.54	0.17	9.69	0.67	0.62	0.73
	2	9.30	1.07			9.70	0.47		
	3	9.27	0.79			9.33	1.30		
WA5sy	1	8.96	2.63	0.76	0.69	9.37	0.60	0.32	0.85
		8.37	1.45			9.30	0.88		
	2 3	8.73	1.10			8.87	1.63		
OWA	1	37.54	2.59	2.28	0.32	38.90	1.10	0.27	0.87
		36.26	4.10			38.44	1.76		
	2 3	37.46	2.42			38.03	2.75		
NWA2sy	1	9.71	0.54	0.88	0.65	9.21	2.28	3.68	0.16
		9.44	0.89			9.74	0.54		
	2 3	9.46	1.21			9.90	0.31		
NWA3sy	1	9.36	0.91	0.42	0.42	9.63	0.50	1.08	0.58
		9.15	1.29			9.39	0.78		
	2 3	8.91	1.51			9.57	0.73		
NWA4sy	1	8.00	1.61	1.01	1.01	8.95	1.03	0.61	0.74
	2	8.26	1.68			9.13	0.97		
	3	8.18	2.27			9.03	1.33		
NWA5sy	1	5.50	2.05	0.99	0.99	6.53	2.22	0.51	0.77
	2	5.96	2.30	0.57		6.87	2.24	0101	0
	3	6.00	2.45			6.50	1.94		
ONWA	1	32.12	4.26	1.31	1.31	34.84	2.99	0.89	0.96
	2	32.74	4.72			35.22	3.07		0.70
	3	32.55	6.70			34.90	3.29		

 Table 4.1. Mean and Standard Deviation (SD) values for word and nonword accuracy at each syllable length for children from different socioeconomic status (SES).

[W- words; NW- nonwords; 1- children of lower socioeconomic status; 1 children of middle socioeconomic status; 3- children of higher socioeconomic status; A2sy - accuracy at 2-syllable length; A3sy - accuracy at 3- syllable length; A4sy - accuracy at 4-syllable length; A5sy - accuracy at syllable length; OWA - overall accuracy for the entire words; ONWA - overall accuracy for the entire nonwords]

Psychometric properties of WNRT-K

Reliability

Reliability refers to how consistently any measurement estimates the characteristic in question. The different types of reliability measure considered here are:

- Test-retest: The consistency of test results produced across a given time interval.
- Inter-rater: The consistency in scoring between different raters.

According to Anastasi and Urbina (1997), coefficients at or above 0.80 are acceptable, while those of 0.90 and above are desirable.

28 Test-retest reliability

To examine the stability of the word and nonword repetition test performance across time, a subsample of 16 children (11%) of the total sample were retested by the same examiner within two weeks of the first test. Intra class correlations were computed for total word + nonword s 27° on the word and nonword repetition test. The test-retest reliability was calculated using the Cronbach's coefficient alpha which was found to be 0.80. This suggested acceptable levels of test-retest reliability for the overall test.

Inter-rater reliability

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Randomly selected subsamples of recordings were used to assess inter-rater reliability. A sample of 14 children (10%) of the total sample was independently blind-rated by the examiner and a trained SLP. Their scores for key measures were compared with online scoring by testers. Acceptable levels of reliability were achieved wherein the Cronbach's coefficient alpha was 0.71.

Validity

Validity is defined as the extent to which a test measures the construct it purports to measure (Anastasi & Urbina, 1997). Test validation demonstrates whether or not appropriate and meaningful inferences can be made from the test.

The test developed was validated by administering it on ten typically developing children in each of the two age groups (4-5years and 5-6years) who were not a part of the earlier subject sample selected. The 19 yenty children were selected from new schools other than the schools from where the earlier 138 children were selected to participate in the study. They were administered with the complete test of 40 words and 40 nonwords along with the practice items auditorily through he 18 hones using a laptop. They were given similar instruction as given to earlier set of children who participated in the study. The repeated responses of the children were transcribed verbatim using broad phonetic transcription online and were also recorded into the laptop. The responses were scored for both the accuracy of the responses and error analysis. The raw scores were calculated and the mean and SD values were computed using descriptive statistics. The mean values of the validation samples were lying within the mean plus or minus SD values or closer to the mean values of the earlier 138 samples children who were tested, suggesting a good validity of the test.

	Validation	samples	Mean of 1	38 children
	Mean	SD	Lower bound	Upper bound
WA2sy	9.60	0.68	9.63	10.21
WA3sy	9.45	0.69	8.89	10.29
WA4sy	9.45	0.69	8.50	10.40
WA5sy	8.95	1.36	7.28	11.56
WOA	37.45	2.50	34.91	40.55
NWA2sy	9.30	0.80	8.56	10.68
NWA3sy	8.55	1.23	8.39	10.34
NWA4sy	8.45	1.57	7.10	10.12
WWA5sy	6.10	1.25	4.01	8.40
NWOA	32.35	3.38	29.54	38.00
WNWA2sy	18.90	1.12	18.78	20.40
WNWA3sy	18.00	1.59	17.64	20.30
WNWA4sy	17.85	1.84	16.06	20.12
WNWA5sy	15.25	2.05	11.83	18.21
TWNWA	69.60	5.27	64.79	77.73
WPVC2sy	99.75	1.12	99.53	100.39
WPVC3sy	99.83	0.75	98.63	100.93
WPVC4sy	99.13	1.47	98.59	100.79
WPVC5sy	99.70	0.98	96.16	101.82
WTPVC	99.57	0.71	98.59	100.47
NWPVC2sy	98.25	2.94	99.16	100.62
WPVC3sy	100.00	0.00	98.71	100.67
WPVC4sy	98.88	1.72	97.30	99.21
NWPVC5sy	95.50	2.59	92.70	99.54
NWTPVC	97.75	1.40	96.59	99.81
WPCC2sy	97.62	3.62	98.15	100.95
WPCC3sy	98.38	2.02	95.10	102.14
WPCC4sy	98.66	3.11	95.88	101.30
WPCC5sy	98.17	3.39	93.57	100.93
WTPCC	98.31	2.15	96.39	100.27
WPCC2sy	97.38	3.62	95.13	101.98
NWPCC3sy	95.59	3.88	94.93	101.33
NWPCC4sy	96.83	3.97	92.16	100.99
NWPCC5sy	92.89	4.80	84.88	99.26
NWTPCC	95.27	3.05	91.80	1 99.66

 Table 4.2. Mean and Standard Deviation (SD) values for the validation samples of the twenty children and the 138 typically developing children considered.

[W- words; NW- nonwords; WNW- words and nonwords combined; A2sy - accuracy at 2-syllable length nonwords; A3sy - accuracy at 3-syllable length nonwords; A4sy - accuracy at 4-syllable length nonwords; A5sy - accuracy at syllable length nonwords; WOA - overall accuracy for words; NWOA -3 erall accuracy for nonwords; TWNWA- accuracy for the entire words and nonwords combined; PVC - percentage of vowels correct; TPVC - total percentage of vowels correct; PCC - percentage of consonants correct; TPCC - total percentage of consonants correct].

Clinical validity

Five children with language impairment were administered with the entire test developed i.e. the word and nonword repetition test to evaluate the clinical validity of the test. The children with the language delay were in the age range of 6.5-9ye 17 and all of them had a language age of 5-6yrs. The children with a language delay included two children with specific 17 guage impairment (SLI) and three children with learning disability (LD) who were diagnosed by a qualified team of professionals including a speech-language pathologist and a clinical psychologist.

The repetition of words and nonwords by the children with language impairment were compared with the repetition scores of language age matched 5-6years old typical developing children. The two groups were compared on both the accuracy of the response, the percentage of vowels/consonants correct and also on the percentage of syllable substitution, omission or addition errors. The raw scores of repetition by both the groups were subjected to the descriptive statistics to obtain the mean and standard deviation values.

A. Accuracy of the responses:

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The mean values indicated that the accuracy of repetition was higher in typically developing children compared to that of the children with language impairment at each syllable length and also on the overall scores in both words and nonwords which is depicted in Table 4.3 and Figures 4.1, 4.2, 4.3 and 4.4 respectively. Further the accuracy of scores decreased from 2 syllable to 5-syllable in both words and nonwords in both the groups. Also the accuracy scores were higher at each syllable length and also on the overall scores for words compared to that of nonwords in both the groups.

 Table 4.3. Mean and Standed Deviation (SD) values for accuracy of words and nonwords at each syllable length for typically developing children and children with language impairment.

Accuracy in words and nonwords		veloping <mark>children</mark> (TD)		n with language irment (CLI)
	Mean	SD	Mean	SD
WA2sy	9.96	0.20	9.80	0.45
WA3sy	9.74	0.56	9.00	1.23
WA4sy	9.54	0.95	9.40	1.34
WA5sy	9.14	1.21	7.80	2.28
WOA	38.39	2.11	36.00	4.58
NWA2sy	9.67	1.23	8.40	0.89
NWA3sy	9.53	0.69	8.00	1.58
NWA4sy	9.04	1.13	4.60	1.34
NWA5sy	6.63	2.09	3.00	1.87
NWOA	34.99	3.11	24.00	3.74
WNWA2sy	19.75	0.47	18.20	1.10
WNWA3sy	19.26	0.95	17.00	2.55
WNWA4sy	18.60	1.73	14.00	1.23
WNWA5sy	15.64	3.13	10.80	3.42
WNWOA	72.68	6.22	60.20	6.72

[W- words; NW- nonwords; WNW- words and nonwords combined; A2sy - accuracy at 2-syllable length nonwords; A3sy - accuracy at 3-syllable length nonwords; A4sy - accuracy at 4-syllable length nonwords; A5sy - accuracy at syllable length nonwords; WOA - overall accuracy for words; NWOA overall accuracy for nonwords; WNWOA- overall accuracy for words and nonwords combined].

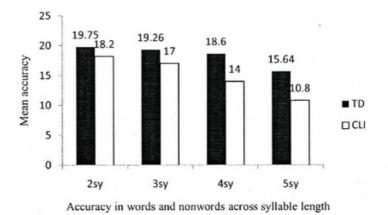
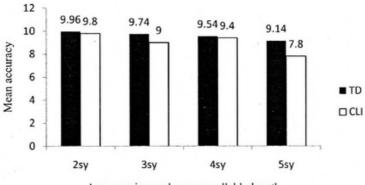
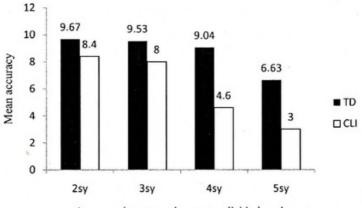


Figure 4.1. Mean accuracy of word and nonword repetition across syllable length in both the groups (CLI- children with language impairment).

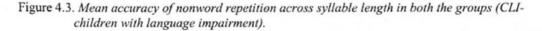


Accuracy in words across syllable length

Figure 4.2. Mean accuracy of word repetition across syllable length in both the groups (CLIchildren with language impairment).



Accuracy in nonwords across syllable length



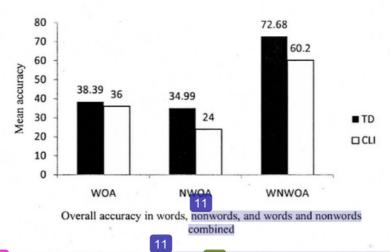


Figure 4.4. 2 ean accuracy of words, nonwords 10 d words and nonwords combined across syllable length in both the groups (CLI- children with language impairment).

The results of Mann-Whitney U test indicated a significant difference existed between children with language impairment and typically developing children in the accuracy of the responses in words only at 3syllable length, where the typically developing c 25 ren obtained higher scores than that of children with language impairment at p<0.05. However, there was no significant difference in the accuracy of words at other syllable lengths and also on the overall scores.

Further, there was a significant difference in the performance 2 etween the two groups on the accuracy of nonwords at all the syllable lengths viz. 2-, 3-, 4-, 5-syllable lengths and also on the overall accuracy scores on nonwords. The typically developing children performed significantly better compared to the children with language impairment on the nonwords. In addition, they obtained significantly higher scores on the total words and nonwords at each of the syllable lengths and also on the overall accuracy of repetition of total words and nonwords at p<0.01. The /z/ values and the level of significance values have been shown in Table 4.4.

Words and nonwords at different syllable lengths	/z/ values	p values
WA2sy	1.53	0.13
WA3sy	2.07	0.04*
WA4sy	0.17	0.86
WA5sy	1.85	0.06
WOA	1.82	0.07
NWA2sy	4.22	0.00**
NWA3sy	2.62	0.01*
NWA4sy	3.85	0.00**
NWA5sy	2.99	0.00**
NWOA	3.73	0.00**
WNW2sy	4.02	0.00**
WNW3sy	2.54	0.01*
WNW4sy	3.60	0.00**
WNW5sy	2.96	0.00**
WNWOA	3.38	0.01**

Table 4.4. A sults of the Mann-Whitney U test for the accuracy of word and nonword repetition between typically developing and children with language impairment.

[W- words; NW- nonwords; WNW- words and nonwords combined; A2s- accuracy at 2-syllable length nonwords; A3s-accuracy at 3-syllable length nonwords; A4s- accuracy at 4-syllable length nonwords; A5s-accuracy at syllable length nonwords; WOA - overall accuracy for words; NWOA overall accuracy for nonwords; WNWOA- overall accuracy for words and nonwords combined; ** p<0.01; * p<0.05].

The results indicated a poorer performance of children with language impairment especially on nonwords at all syllable lengths. This suggests that the entire nonword repetition task viz. even the shorter syllable length nonwords were useful in differentiating children with language impairment from the language matched typically developing children.

B. Percentage of phonemes correct:

The mean and the SD 2 uses for the percentage of phonemes correct were computed using descriptive statistics. The percentage 1 f vowels/consonants correct was compared between the two groups and is shown in Table 4.5. Both the groups obtained higher percentage of vowels correct compared to that of consonants. This has been depicted in Figure 4.5.

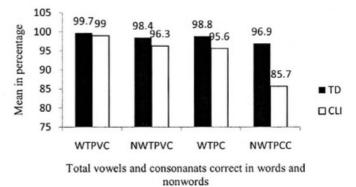
The mean values of PVC (percentage of vowels correct) in words indicated that the children with language impairment obtained lower PVC at 5syllable length in words, whereas typically developing children obtained similar mean scores at all the syllable lengths in words. A 32 nilar pattern was observed in nonwords. Further the PVC in nonwords were higher for typically developing children compared to the children with language impairment as can be observed from the mean values. The typically developing children attained similar means of PVC on 2-, 3-, and 4-syllable lengths nonwords but achieved lower PVC mean scores on only 5-syllable length nonwords, what the children with language impairment obtained lower mean PVC scores on 2, 4, and also on 5-syllable length nonwords.

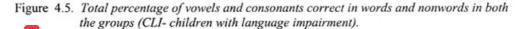
The mean values of the PCC (percentage 16 photomatic correct) indicated that the PCC was higher in words compared to that of nonwords in both typically developing children and children with language impairment. The mean PCC values in nonwords decreased from 2-syllable length nonwords to 5-syllable length nonwords. The children with language impairment obtained very less C scores at 5-syllable length nonwords compared to the typically developing children. The same is shown in Table 4.5.

	Typically devel	oping <mark>children</mark> (TD)		ith language ent (CLI)
WPVC3sy WPVC4sy WPVC5sy WTPVC NWPVC3sy NWPVC4sy NWPVC5sy NWPVC5sy WPCC2sy WPCC3sy WPCC3sy WPCC4sy WPCC5sy WPCC5sy WPCC2sy NWPCC2sy NWPCC3sy	Mean	SD	Mean	SD
WPVC2sy	99.93	0.59	100.00	0.00
WPVC3sy	99.91	0.55	99.33	1.49
WPVC4sy	99.72	1.30	100.00	0.00
WPVC5sy	99.58	1.11	97.60	2.61
WTPVC	99.72	0.64	99.00	1.08
NWPVC2sy	99.79	1.01	95.00	6.12
NWPVC3sy	99.68	0.99	98.67	1.83
NWPVC4sy	99.34	1.39	93.50	2.85
NWPVC5sy	96.25	3.47	93.20	5.93
NWTPVC	98.41	1.44	96.29	1.17
WPCC2sy	99.80	0.96	99.05	2.13
WPCC3sy	98.94	3.99	96.47	6.38
WPCC4sy	98.85	2.56	98.05	4.36
WPCC5sy	97.84	3.11	91.54	11.59
WTPC	98.76	1.67	95.54	6.61
NWPCC2sy	99.27	2.06	94.29	3.98
NWPCC3sy	98.69	2.41	93.53	4.83
NWPCC4sy	97.76	3.44	84.89	9.51
NWPCC5sy	93.43	5.96	77.69	8.88
NWTPCC	96.87	2.82	85.68	6.83

 Table 4.5. Mean and Standard Dev 15 on (SD) for PVC and PCC in words and nonwords at each syllable length for typically developing children and children with language impairment.

[W - words; NW - nonw 3 ls; 2sy - 2-syllable length, 3sy - 3-syllable length; 4sy - 4-syllable length; 5sy - 5-syllable length; PVC - percentage of vowels correct; TPVC - total percentage of vowels correct; PCC - percentage of consonants correct; TPCC - total percentage of consonants correct]





Mann-Whitney U test was carried out to find out the significant difference, if any, in the PVC between the two groups in both words and nonwords. The results indicated that there was a significant difference in the PVC in words only at 5-syllable length and also at the total PVC in word24 etween the two groups (p<0.05). The PVC in nonwords was significantly different between the children with language impairment and typically developing children at 2-, 3-, 4-, and total PVC in nonwords. However 12 e was no significant

difference in the PVC between the two groups at 5-sy 14 length nonwords. The /z/ and p values have been depicted in Table 4.6. The lesser PVC in children with language impa 10 ent than the typically developing children suggests the relatively weaker phonological encoding in children with language impairment during the repetition tasks.

The PCC in words between the groups compared using Mann-Whitney U test indicated that there was no significant difference in the PCC between the two groups at any of the syllable lengths. However the PCC in nonwords were significantly different between 1 two groups at all the syllable lengths, and also on the overall PCC in nonwords. The /z/ and p values have been depicted in Table 4.6. The children in both the groups obtained higher PVC than the PCC.

Table 4.6. Results of Mann-Whitney U test for the PVC and	PCC between typically developing
children and children with language impairment.	

PVC and PCC for words and nonwords	/z/ values	p values	
WPVC2sy	0.26	0.79	
WPVC3sy	1.91	0.06	
WPVC4sy	0.61	0.55	
WPVC5sy	2.79	0.01*	
WTPVC	2.21	0.03*	
NWPVC2sy	4.54	0.00**	
NWPVC3sy	2.06	0.04*	
NWPVC4sy	4.53	0.00**	
NWPVC5sy	1.31	0.19	
NWTPVC	2.90	0.00**	
WPCC2sy	1.53	0.13	
WPCC3sy	1.21	0.23	
WPCC4sy	0.06	0.96	
WPCC5sy	1.93	0.05	
WTPC	1.90	0.06	
NWPCC2sy	4.02	0.00**	
NWPCC3sy	2.88	0.00**	
NWPCC4sy	3.62	0.00**	
NWPCC5sy	3.39	0.00**	
NWTPCC 1	3.60	0.00**	

[W - words; NW - nonwords; 2sy - 2-syllable length, 3sy - 3-syllable length; 43 - 4-syllable length; 5sy - 5-syllable length; PVC - percentage of vowels correct; TPVC - total percentage of vowels correct; PCC - percentage of consonants correct; TPCC - total percentage of consonants correct; ** p<0.01; * p<0.05]

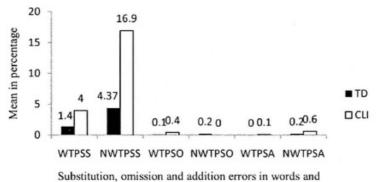
C. Percentage of errors:

The errors such as syllable substitutions, omissions and additions were noted and converted into percentage values. The mean and SD values were computed using the descriptive statistics for all the errors in 10th the groups which have been depicted in Table 4.7. The mer 34 alues suggested that the syllable substitutions were the most frequent type of errors seen in the repetition of words and nonwords in both the groups compared to the syllable omissions and additions. The percentage of syllable substitutions (PS 2 was more in nonwords than words in both the groups. Also the PSS errors increased with the increase in the syllable length in both the groups. Furthermore the mean values of PSS indicated a higher percentage of errors in the children with language impairment compared to the typically developing children. This has been depicted in Figure 4.6.

Errors	Typically develop			Children with language				
	(TD)			nent (CLI)				
	Mean	SD	Mean	SD				
WPSS2sy	0.2	1.01	1.00	2.24				
WPSS3sy	1.0	2.14	4.00	5.48				
WPSS4sy	1.15	2.52	2.00	4.47				
WPSS5sy	2.28	3.43	6.80	10.83				
WTPSS	1.36	1.84	4.00	6.17				
NWPSS2sy	0.83	2.22	8.00	6.71				
NWPSS3sy	1.53	2.68	8.00	7.67				
NWPSS4sy	2.50	3.36	18.50	7.42				
NWPSS5sy	8.97	6.94	24.40	5.90				
NWTPSS	4.37	3.20	16.88	5.52				
WPSO2sy	0.14	1.19	0.00	0.00				
WPSO3sy	0.00	0.00	0.00	0.00				
WPSO4sy	0.17	1.21	0.00	0.00				
WPSO5sy	0.36	1.44	1.20	1.79				
WTPSO	0.12	0.44	0.43	0.64				
NWPSO2sy	0.00	0.00	0.00	0.00				
NWPSO3sy	0.00	0.00	0.67	1.49				
NWPSO4sy	0.03	0.30	0.00	0.00				
NWPSO5sy	0.58	1.14	2.00	3.46				
NWTPSO	0.22	0.41	0.00	0.00				
WPSA2sy	0.07	0.59	0.00	0.00				
WPSA3sy	0.00	0.00	0.00	0.00				
WPSA4sy	0.03	0.29	0.00	0.00				
WPSA5sy	0.06	0.33	0.40	0.89				
WTPSA	0.04	0.16	0.14	0.32				
NWPSA2sy	0.42	1.63	1.00	2.24				
NWPSA3sy	0.09	0.55	0.00	0.00				
NWPSA4sy	0.14	0.58	0.50	1.12				
NWPSA5sy	0.28	0.79	0.80	1.10				
NWTPSA	0.21	0.39	0.57	0.60				

 Table 4.7. Mean and Standard Deviation (SD) values for percentage of differ 23 errors in words and nonwords at each syllable length for typically developing and children with language impairment.

[W-words; NW- non 10rds; 2sy - 2-syllable length, 3sy - 3-syllable length; 4sy - 4-syllable length; 5sy - 5-syllable length; PSS - percentage of syllable substitutions; TPT - Total percentage of syllable substitutions; PSO - percentage of syllable omissions; TPSO - Total percentage of syllable additions; PSA - percentage of syllable additions; TPSA - Total percentage of syllable additions;



nonwords

Figure 4.6. Total percentage of errors (PSS, PSO & PSA) in both the groups of children for words and nonwords (CLI- children with language impairment).

The Mann-Whitney U test suggested a significant difference in the PSS errors in nonwords at each of the syllable length between the children with language impairment and typically develop 1 children (p<0.05). However, the results showed no significant difference in the PSS in words at different syllable lengths. The PSO (percentage of sy 2 ble omissions) was significantly different between the two groups at only 5-syllable length words and also at only 3-syllable length nonwords. The /z/ and the /p/ values of PSS and PSO have been depicted in Table 4.8. The PSO were observed less frequently than the PSS in repetition tasks. This could be attributed to the fact that, a 30 length of the nonword increased, the participants experienced difficulty with forming or holding detailed phonological representations in working memory. Nevertheless no significant difference was found in PSA (percentage of syllable additions) between the two groups at different syllable lengths in both words and nonwords as the PSA were very less frequently seen during the repetition tasks.

Percentage of errors in words &	/z/ values	p values		
nonwords	1.52	0.12		
WPSS2sy	1.53	0.13		
WPSS3sy	1.95	0.05		
WPSS4sy	0.16	0.87		
WPSS5sy	1.31	0.19		
WTPSS	1.47	0.14		
NWPSS2sy	4.68	0.00**		
NWPSS3sy	2.75	0.01*		
NWPSS4sy	3.85	0.00**		
NWPSS5sy	3.35	0.00**		
NWTPSS	3.72	0.00**		
WPSO2sy	0.26	0.79		
WPSO3sy	0.00	1.00		
WPSO4sy	0.38	0.71		
WPSO5sy	2.19	0.03*		
WTPSO	2.00	0.05		
NWPSO2sy	0.00	1.00		
NWPSO3sy	3.80	0.00**		
NWPSO4sy	0.26	0.79		
NWPSO5sy	0.99	0.32		
NWTPSO	1.26	0.21		
WPSA2sy	0.26	0.79		
WPSA3sy	0.00	1.00		
WPSA4sy	0.26	0.79		
WPSA5sy	1.91	0.06		
WTPSA	1.26	0.21		
NWPSA2sy	1.02	0.31		
NWPSA3sy	0.38	0.71		
NWPSA4sy	1.26	0.21		
NWPSA5sy	1.56	0.11		
NWTPSA 1	1.80	0.07		

 Table 4.8. Results of the Mann-Whitney U test for the percentage of errors between typically developing children and children with language impairment.

[W-words; NW- nor 10rds; 2sy - 2-syllable length, 3sy - 3-syllable length; 4sy - 4-syllable length; 5sy - 5-syllable length; PSS - percentage of syllable substitutions; TPT - Total percentage of syllable substitutions; PSO - percentage of syllable omissions; TPSO -Total percentage of syllable omissions; PSA - percentage of syllable additions; TPSA - Total percentage of syllable additions; ** p<0.01; * p<0.05]

To summarize, the findings from the standardization sample demonstrate that the reliability and validity of the WNRT-K are adequate and confirm that this test is psychometrically robust.

APPENDIX A

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NONWORD SCORE SHEET

Practice Items	Number of Presentations	Discontinue Rule	Accuracy & Error analysis
finite field in the second secon	If the child does not respond to a practice item allow up to two further presentations.	None: attempt to administer all items.	Calculate a) Accuracy- i) total number of nonwords correct and also number of nonwords correct at each syllable length; ii) total number and percentage of vowels and consonants correct; b) Error analysis- total number and percentage of syllable substitutions, omissions and additions. All the measures should be calculated at each of the syllable length and on overall nonword test items.

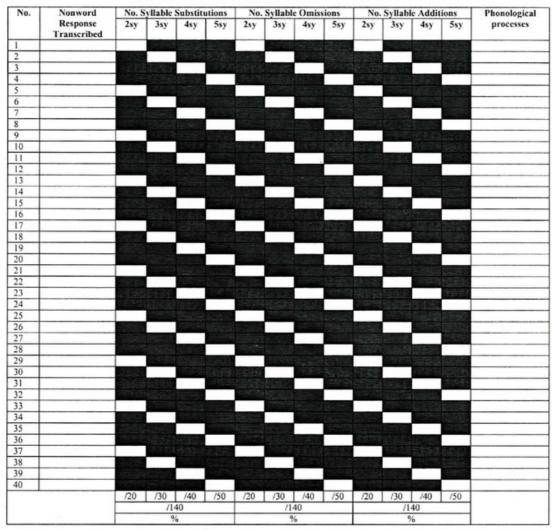
Item Score Circle/Tick 1 if the child repeats the item correctly, with all phonemes of the target present in the correct order (allowing for only systematic/consistent substitutions due to phonological processes and dialectal influences). Circle/Tick 0 if the response is not a correct repetition. Circle/Tick NR if the child refuses to attempt a repetition. If the child self-corrects, score the self-corrected response. For vowels and consonants correct and types of errors, calculate the number and then convert it into percentage.

No.	Target	Score		Transcription						No	No. consonants correct					
					2sy	3sy	4sy	5sy	2sy	3sy	4sy	5sy	2sy	3sy	4sy	5sy
1	тера	1 0	NR							1		Talen Street		and the second	-	
2	lippat fa	1 0	NR												Constant and	
3	raka:tari	1 0	NR									法犯罪				E al
4	t∫agaļumat∫a	1 0	NR		No.								a section of	Res and		
5	t∫e:pa	1 0	NR							1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-		Sector F				
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7	ga rasaga	1 0	NR											Selection and the		
8	ma:]uvigaņa	1 0	NR						空田 谷	a sector			12.00		A CAPITAL	
9	no:li	1 0	NR							1000000				197		
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11	jallipema	1 0	NR						125.0			STORE OF		100		1000
12	t∫iļuțeraga	1 0	NR				CHERRY .		ule la co		Sales and		And the second		10004	
13	de:ra	1 0	NR												in the second	Sec. 1
14	dikame	1 0	NR		17.24		STREED B	E Cold Set	i Maria		200		Sale Sale		2252	
15	padi:gaļu	1 0	NR						1							
16	no:tinedda:du	1 0	NR								Contractor 1		1 contraction		Greek L	
17	bunne	1 0	NR			AN COLUMN		N TANK SHE		1000	-	a station of the		3	E-STE	lester.
18	dikkata	1 0	NR		STREET,		两些灵信		a Barratsan		CHE CONT		RIVER S		253012	
19	giladema	1 0	NR		563.45	-united in	-	and the second		E CAR		1012		Martin Sala		1000
20	pabalugala	1 0	NR				Dem-ta			C. Theorem	100000				经设法	
21	mu:pi	1 0	NR			-14-5-54		i i i i i i i i i i i i i i i i i i i				- Aller				CHER
22	tipatfa	1 0	NR		CONTRACTOR OF		1216-122	n (110) 1913 - 1913 1914 - 1913	in destination		10.28 (0.20) (1.20)	a Gastalan	a Magnitista		19-09-09-09	16.85
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24	macravipama	1 0	NR				Linghier		122100	10.00	1040213				- Carlos	
25	weda	1 0	NR				National State			College and		100025	and the second division of the			Piter A
26	likkutfa	1 0	NR		STREET, STREET,	CONTRACTOR OF			2 5-65-21-654	and the second second			12000000	Contract of Contracts	553.03	
27	majunega	1 0	NR			2013-33-00E	EN DA POSTA				10000000000	1000000	100000	ABRET		
28	garelukudu	1 0	NR		10 A		and the second		1000	1993年1993年1993年1993年1993年1993年1993年1993	E State	1	(Chickly)	10-11-1-1-1	A LOUGH	
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31	gabi:juga	1 0	NR								100.00.00.0					
32	dugijutavu	1 0	NR		Contraction of the				STATES		- Barter		111230	Bet Played	100000	
33	ke ga	1 0	NR			22. Hall	1				the states	100		S MERCE	Baseline.	
34	∫aņe:ga	1 0	NR		110			in the				Telescole a	Contrast of			T T
35	galebalu	1 0	NR			Part - And				の新祥				Lugar.		
36	dinnakagalu	1 0	NR				ing then the		- Section in	a states	Service:			ALC: NO	Sec.	
37	bi:ja	1 0	NR											THE BA	- Ballingtone	
38	bejura	1 0	NR				COLUMN STATE		1.15		CTR (D) (S)		Sardisari.		State of the	1
39	majugara	1 0	NR			Sections.		17-34X1	10	States and				State State		1000
40	dabaka:neji	1 0	NR				Case of the			-			ALC: NO	En Caper So		
	Nonword total	40	1		/10	/10	/10	/10	/20	/30	/40	/50	/20	/30	/40	/50
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No.	Word Response	No. S	yllable 3	No. Syllable Substitutions No. Syllable Omissions No. Syllable Additions				No. Syllable Omissions 2sy 3sy 4sy 5sy			No. Syllable Additions		Phonological	
	Transcribed	2sy		4sy		2sy	3sy	4sy	5sy	2sy	3sy	4sy	5sy	processes
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15		Orr that	Colours 1								-202			
16				1000								No.		
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19							-							
20						建建筑			-					
21			- Contract - Page			_					100			
22												1.1.1		
23									1000					
24		11-22					Sec. 20							
25			STATES OF											
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27														
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WORD SCORE SHEET: TYPES OF SYLLABLE ERRORS



NONWORD SCORE SHEET: TYPES OF SYLLABLE ERRORS

Appendix B

C			Ge	nder		T	1.1
Syllable	Age	Ma	les	Fem	ales	- 10	otal
length	group	Mean	SD	Mean	SD	Mean	SD
	4-5yrs	9.84	0.37	9.85	0.36	9.85	0.36
WA2sy	5-6yrs	9.93	0.25	9.98	0.15	9.96	0.20
	Total	9.89	0.32	9.92	0.27	9.91	0.29
	4-5yrs	9.38	0.87	9.50	0.75	9.44	0.81
WA3sy	5-6yrs	9.63	0.67	9.81	0.46	9.74	0.56
	Total	9.50	0.78	9.67	0.62	9.59	0.70
	4-5yrs	9.38	1.07	9.47	0.83	9.42	0.95
WA4sy	5-6yrs	9.63	0.89	9.48	0.99	9.54	0.95
	Total	9.50	0.99	9.47	0.92	9.49	0.95
	4-5yrs	8.47	1.41	8.88	2.42	8.68	1.99
WA5sy	5-6yrs	9.13	1.17	9.14	1.26	9.14	1.21
	Total	8.79	1.33	9.03	1.86	8.92	1.64
	4-5yrs	36.56	4.03	37.41	2.38	37.00	3.29
WOA	5-6yrs	38.33	2.17	38.43	2.10	38.89	2.11
	Total	37.42	3.36	37.97	2.27	37.00	3.29
	4-5yrs	9.53	0.80	9.59	0.86	9.56	0.83
WA2sy	5-6yrs	9.77	0.50	9.60	1.56	9.67	1.23
	Total	9.65	0.68	9.60	1.29	9.62	1.06
	4-5yrs	9.13	1.24	9.27	1.34	9.20	1.18
WA3sy	5-6yrs	9.50	0.78	9.55	0.63	9.53	0.69
	Total	9.31	1.05	9.42	0.90	9.37	0.97
	4-5yrs	7.88	1.60	8.38	1.84	8.12	1.74
WA4sy	5-6yrs	8.77	1.36	9.24	0.91	9.04	1.13
	Total	8.31	1.54	8.86	1.46	8.61	1.52
	4-5yrs	5.50	2.14	6.03	2.25	5.77	2.20
WA5sy	5-6yrs	6.13	2.32	6.98	1.87	6.63	2.09
	Total	5.81	2.23	6.55	2.09	6.22	2.18
	4-5yrs	31.50	4.65	33.32	4.93	32.44	4.85
NWOA	5-6yrs	34.20	3.40	35.55	2.79	34.99	3.11
	Total	32.81	4.28	34.55	4.03	33.77	4.21

 Table B.1. Mean and Standard Deviation (SD) for words and nonwords separately across different syllable length, age and gender.

[W- words; NW- nonwords; A2sy-accuracy at 2-syllable length; A3sy-accuracy at 3-syllable length; A4sy- accuracy at 4-syllable length; A5sy-accuracy at syllable length; WOA - overall accuracy for words; NWOA - overall accuracy for nonwords]

.

Syllable	Age	33 ema	les	Ma	les	Tot	al
length	group	Mean	SD	Mean	SD	Mean	SD
WNWA2sy	4-5yrs	19.44	1.08	19.38	1.01	19.41	1.04
	5-6yrs	19.79	0.42	19.70	0.54	19.75	0.47
	Total	19.63	0.80	19.53	0.82	19.59	0.81
WNWA3sy	4-5yrs	18.77	1.67	18.53	1.55	18.65	1.60
	5-6yrs	19.36	0.76	19.13	1.17	19.26	0.95
	Total	19.09	1.28	18.82	1.40	18.97	1.33
WNWA4sy	4-5yrs	17.82	2.34	17.25	2.02	17.55	2.19
	5-6yrs	18.74	1.53	18.40	1.98	18.60	1.73
	Total	18.33	1.98	17.81	2.06	18.09	2.03
WNWA5sy	4-5yrs	14.65	3.19	14.00	3.10	14.33	3.14
	5-6yrs	15.91	3.28	15.27	2.94	15.64	3.13
	Total	15.34	3.28	14.61	3.06	15.02	3.19
TWNWA	4-5yrs	70.62	6.68	68.75	6.08	69.71	6.42
	5-6yrs	73.12	6.97	72.07	5.04	72.68	6.22
	Total	72.00	691	70.36	5.80	71.26	6.47

 Table B.2.
 It an and Standard Deviation (SD) values for word and nonword accuracy combined at each syllable length for both the age groups across gender.

[WNW- words and nonwords combined; A2sy - accuracy at 2-syllable length; A3sy - accuracy at 3syllable length; A4sy - accuracy at 4-syllable length; A5sy - accuracy at syllable length, TWNWAaccuracy for the entire words and nonwords combined]

W/NW different	CA	Fem	ales	Ma	les	Total		
syllable lengths		Mean	SD	Mean	SD	Mean	SD	
	4-5yrs	100.00	0.00	100.00	0.00	100.00	0.00	
WPVC2sy	5-6yrs	100.00	0.00	99.83	0.91	99.93	0.59	
	Total	100.00	0.00	99.92	0.64	99.96	0.43	
	4-5yrs	99.90	0.57	99.38	2.15	99.65	1.56	
WPVC3sy	5-6yrs	100.00	0.00	99.78	0.85	99.91	0.55	
	Total	99.96	0.38	99.57	1.65	99.78	1.15	
	4-5yrs	99.71	0.82	99.61	0.92	99.66	0.87	
WPVC4sy	5-6yrs	99.58	1.65	99.92	0.46	99.72	1.30	
	Total	99.64	1.34	99.76	0.75	99.69	1.12	
	4-5yrs	98.00	4.85	98.69	2.36	98.33	3.84	
WPVC5sy	5-6yrs	99.67	0.98	99.47	1.28	99.58	1.11	
	Total	98.92	3.40	99.07	1.94	98.99	2.83	
	4-5yrs	99.37	0.976	99.29	1.32	99.33	1.15	
WTPVC	5-6yrs	99.76	0.58	99.67	0.72	99.72	0.64	
	Total	99.59	0.80	99.47	1.08	99.53	0.94	
	4-5yrs	100.00	0.00	100.00	0.00	100.00	0.00	
NWPVC2sy	5-6yrs	99.88	0.77	99.67	1.27	99.79	1.01	
	Total	99.93	0.574	99.84	0.89	99.89	0.73	
	4-5yrs	99.71	0.96	99.69	0.99	99.70	0.97	
NWPVC3sy	5-6yrs	99.68	0.99	99.67	1.017	99.68	0.99	
	Total	99.69	0.97	99.68	0.99	99.69	0.98	
	4-5yrs	98.82	2.24	98.60	1.79	98.71	2.02	
NWPVC4sy	5-6yrs	99.23	1.61	99.50	1.02	99.34	1.39	
	Total	99.05	1.91	99.03	1.53	99.04	1.74	
	4-5yrs	95.94	3.67	96.00	3.09	95.97	3.37	
NWPVC5sy	5-6yrs	96.57	2.77	95.80	4.28	96.25	3.47	
	Total	96.29	3.20	95.90	3.68	96.12	3.41	
	4-5yrs	98.13	1.72	97.81	1.80	97.98	1.75	
NWTPVC	5-6yrs	98.54	1.23	98.24	1.70	98.41	1.44	
	Total	98.36	1.48	198.02	1.75	98.20	1.61	

Table B.3. Mean and Standard Deviation (SD) values for PVC in both words and nonwords a	ıt
different syllable lengths for both the age groups and gender.	

[W - words; NW - nonwords; CA- Chronological age, PVC - percentage of vowels correct; TPVC - total percentage of vowels correct; 2sy - 2-syllable length, 3sy - 3-syllable length; 4sy - 4-syllable length; 5sy - 5-syllable length]

W/NW at	Chronological	Fem	ales	Ma	les	Tot	al
different syllable lengths	age	Mean	SD	Mean	SD	Mean	SD
	4-5yrs	100.00	0.00	100.00	0.00	100.00	0.00
WPCC2sy	5-6yrs	100.00	0.00	99.83	0.91	99.93	0.59
WI CC25y	Total	100.00	0.00	99.92	0.64	99.96	0.43
	4-5yrs	99.90	0.57	99.38	2.15	99.65	1.56
WPCC3sy	5-6yrs	100.00	0.00	99.78	0.85	99.91	0.55
	Total	99.96	0.38	99.57	1.65	99.78	1.15
	4-5yrs	99.71	0.82	99.61	0.92	99.66	0.87
WPCC4sy	5-6yrs	99.58	1.65	99.92	0.46	99.72	1.30
	Total	99.64	1.34	99.76	0.75	99.69	1.12
	4-5yrs	98.00	4.85	98.69	2.36	98.33	3.84
WPCC5sy	5-6yrs	99.67	0.98	99.47	1.28	99.58	1.11
	Total	98.92	3.40	99.07	1.94	98.99	2.83
	4-5yrs	99.37	0.976	99.29	1.32	99.33	1.15
WTPCC	5-6yrs	99.76	0.58	99.67	0.72	99.72	0.64
	Total	99.59	0.80	99.47	1.08	99.53	0.94
	4-5yrs	100.00	0.00	100.00	0.00	100.00	0.00
NWPCC2sy	5-6yrs	99.88	0.77	99.67	1.27	99.79	1.01
	Total	99.93	0.574	99.84	0.89	99.89	0.73
	4-5yrs	99.71	0.96	99.69	0.99	99.70	0.97
NWPCC3sy	5-6yrs	99.68	0.99	99.67	1.017	99.68	0.99
•	Total	99.69	0.97	99.68	0.99	99.69	0.98
	4-5yrs	98.82	2.24	98.60	1.79	98.71	2.02
NWPCC4sy	5-6yrs	99.23	1.61	99.50	1.02	99.34	1.39
	Total	99.05	1.91	99.03	1.53	99.04	1.74
	4-5yrs	95.94	3.67	96.00	3.09	95.97	3.37
NWPCC5sy	5-6yrs	96.57	2.77	95.80	4.28	96.25	3.47
	Total	96.29	3.20	95.90	3.68	96.12	3.41
	4-5yrs	98.13	1.72	97.81	1.80	97.98	1.75
NWTPCC	5-6yrs	98.54	1.23	98.24	1.70	98.41	1.44
	Total	98.36	1.48	98.02	1.75	98.20	1.61

 Table B.4. Mean and Standard Deviation (SD) values for the PCC in both words and nonwords at different syllable lengths for both the age groups and gender.

[W - words; NW - nonw 1cs; PCC - percentage of consonants correct; TPC - total percentage of consonants correct; 2sy - 2-syllable length, 3sy - 3-syllable length; 4sy - 4-syllable length; 5sy - 5-syllable length]

				Ch	ronological	age			
		4-5years			5-6years			Total	
	Mean	Median	SD	Mean	Median	SD	Mean	Median	SD
WPSS2sy	0.83	0.00	1.88	0.21	0.00	1.01	0.51	0.00	1.52
WPSS3sy	2.02	0.00	3.35	1.02	0.00	2.14	1.50	0.00	2.82
WPSS4sy	1.90	0.00	3.22	1.15	0.00	2.52	1.50	0.00	2.89
WPSS5sy	3.06	2.00	3.37	2.28	2.00	3.43	2.65	2.00	3.41
WTPSS	2.08	1.43	2.07	1.36	0.71	1.84	1.70	1.07	1.98
NWPSS2sy	2.65	0.00	4.90	0.83	0.00	2.22	1.70	0.00	3.84
NWPSS3sy	2.93	0.00	4.28	1.53	0.00	2.68	2.20	0.00	3.59
NWPSS4sy	5.46	2.50	5.22	2.50	2.50	3.36	3.91	2.50	4.58
NWPSS5sy	11.55	10.00	8.38	8.97	8.00	6.94	10.21	8.00	7.75
NWTPSS	6.73	5.00	5.18	4.37	3.57	3.20	5.50	4.29	4.41
WPSO2sy	0.00	0.00	0.00	0.14	0.00	1.18	0.07	0.00	0.85
WPSO3sy	0.10	0.00	0.58	0.00	0.00	0.00	0.05	0.00	0.40
WPSO4sy	0.11	0.00	0.53	0.17	0.00	1.21	0.15	0.00	0.94
WPSO5sy	0.64	0.00	1.50	0.36	0.00	1.44	0.49	0.00	1.47
WTPSO	0.28	0.00	0.64	0.12	0.00	0.44	0.20	0.00	0.55
NWPSO2sy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NWPSO3sy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NWPSO4sy	0.19	0.00	1.01	0.04	0.00	0.30	0.11	0.00	0.73
NWPSO5sy	0.85	0.00	1.53	0.58	0.00	1.14	0.71	0.00	1.34
NWTPSO	0.35	0.00	0.64	0.22	0.00	0.41	0.28	0.00	0.54
WPSA2sy	0.08	0.00	0.62	0.07	0.00	0.59	0.07	0.00	0.60
WPSA3sy	0.05	0.00	0.41	0.00	0.00	0.00	0.02	0.00	0.28
WPSA4sy	0.04	0.00	0.31	0.04	0.00	0.30	0.04	0.00	0.30
WPSA5sy	0.15	0.00	0.53	0.06	0.00	0.33	0.10	0.00	0.44
WTPSA	0.09	0.00	0.27	0.04	0.00	0.16	0.06	0.00	0.22
NWPSA2sy	0.00	0.00	0.00	0.42	0.00	1.63	0.22	0.00	1.19
NWPSA3sy	0.15	0.00	0.70	0.09	0.00	0.55	0.12	0.00	0.63
NWPSA4sy	0.30	0.00	0.82	0.14	0.00	0.58	0.22	0.00	0.71
NWPSA5sy	0.80	0.00	1.65	0.28	0.00	0.79	0.53	0.00	1.30
NWTPSA	0.36	0.00	0.58	0.21	0.00	0.39	0.28	0.00	0.49

 Table B.5. Mean, median and Standard Deviation (SD) values for the errors at each syllable length in words and nonwords for both the age groups.

[W-words; NW- networds; 2sy- 2-syllable length, 3sy- 3-syllable length; 4sy-4-syllable length; 5sy-5-syllable length; PSS - percentage of syllable substitutions; TPS1 -Total percentage of syllable substitutions; PSO - percentage of syllable omissions; TPSO -Total percentage of syllable omissions; PSA - percentage of syllable additions; TPSA -Total percentage of syllable additions]

Appendix C

Percentile	Scores	Overall word a	ccuracy scores
		4-5years	5-6years
5		30.70	33.00
10		33.00	35.30
25		36.00	38.00
50		38.00	39.00
75		39.00	40.00
90		40.00	40.00
95		40.00	40.00
100)	40.00	40.00

Table C.1. Percentile scores for the overall word accuracy scores.

Note: Percentile '5' indicates that only 5% of the children are scoring less than 30.70 in 4-5years age group and less than 33.00 in 5-6years age group in the repetition of words.

Percentile	Overall nonword accuracy scores						
	4-5years	5-6years					
5	21.05	29.00					
10	24.70	30.00					
25	30.00	33.00					
50	34.00	35.00					
75	36.00	37.75					
90	37.30	39.00					
95	38.00	39.00					
100	40.00	40.00					

Table C.2. Percentile scores for the overall nonword accuracy scores.

Note: Percentile '5' indicates that only 5% of the children are scoring less than 21.05 in 4-5years age group and less than 29.00 in 5-6years age group in the repetition of nonwords.

Percentile	Overall word and nonword accuracy scores					
	4-5years	5-6years				
5	56.70	61.95				
10	59.70	67.00				
25	65.75	71.00				
50	71.50	74.00				
75	75.00	76.75				
90	76.30	78.00				
95	77.00	79.00				
100	80.00	80.00				

Table C.3. Percentile scores for the overall word and nonword accuracy scores.

Note: Percentile '5' indicates that only 5% of the children are scoring less than 56.70 in 4-5years and in 5-6years only 5% of the children are scoring less than 61.95 in the overall task of word and nonword repetition.

Percentile Ranks	Classification
90-100	Above average performance
50-89	Average performance
5-49	Poor performance

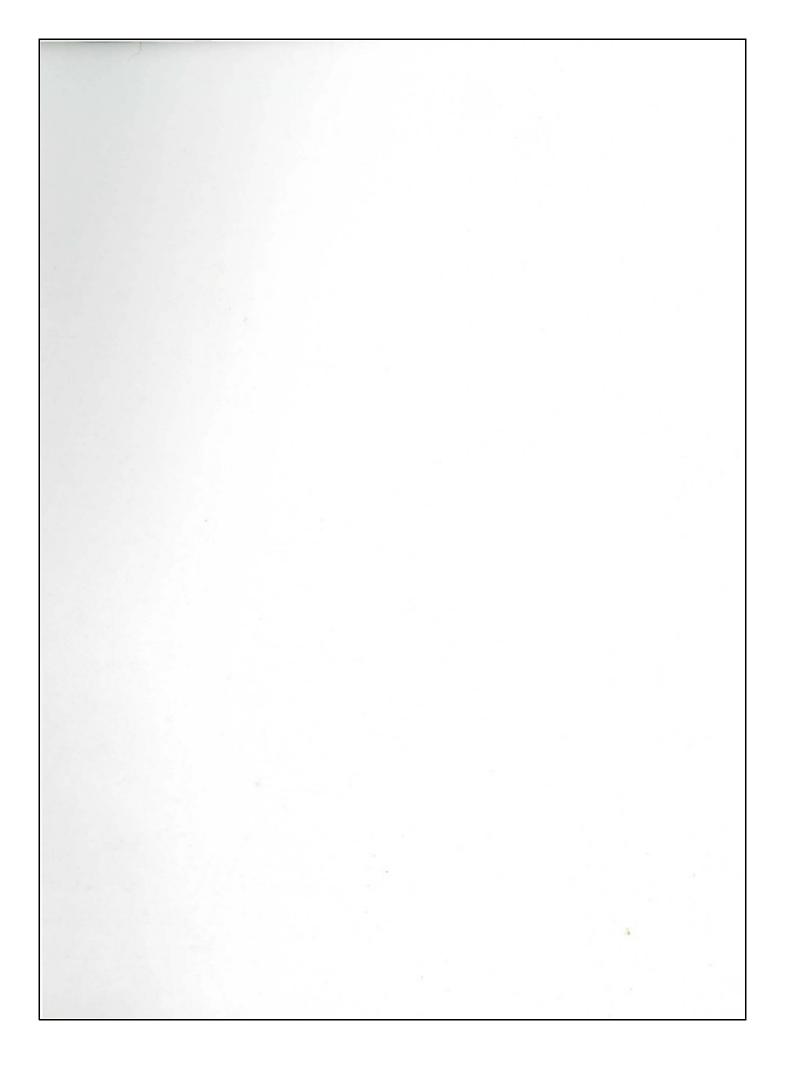
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