1-Word and Non-Word Repetition Test in Kannada

by Swapnan Shylajak

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MANUAL

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Under the title

Word and Nonword Repetition Test in Kannada (WNRT-K)

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Preface

Typical language development and use involves some important cognitive processes including attending to what others say, perceiving phonemes, storing them in a sequence, relating the sequence of phonemes to words that have already been learned, and responding verbally. These cognitive processes shape the use of speech and language skills for communication which is essential for human beings. Owing to several factors these cognitive processes may not be well developed in individuals which could lead to a delay or deviation in the normal development of speech and language. However, children with such impairments could be managed well, if the cognitive deficits are identified and diagnosed early. It is with this aim that the authors have developed the test which would help in the assessing the phonological processing and phonological memory abilities in young children speaking Kannada.

Dr. Swapna N., with the grant from AIISH Research Fund has developed the test. Dr. Swapna is a faculty in the Department of Speech-Language Pathology. She is known for her work in the area of speech disorders and their rehabilitation. Dr. Swapna is committed and dedicated to her work. India is a multilingual and multicultural nation. There is a dearth for such test materials in Indian languages. In this context the effort by Dr. Swapna is welcome. I congratulate Dr. Swapna for coming out with this test.

This test could be used at three levels depending on the purpose of assessment. Level 1 is used to identify children for referral and as the first step of a speech and language assessment. Levels 2 and 3 analyze performance in greater depth, to identify areas of strengths and difficulties for intervention. It is hoped that this test will help the speech-language pathologists in assessing the relevant cognitive processes in Kannada speaking children with communication disorders. This test can also be used to screen children at risk for acquiring speech and language disorders. Your comments on the test are most welcome. For any further queries or suggestions please contact email: director@aiishmysore.in [Subject: Word and Nonword Repetition Test in Kannada (WNRT-K)].

Dr.S.R.Savithri
Director

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ABOUT THE AUTHORS

Dr. Swapna N. is a Lecturer in Speech Pathology, Department of Speech-Language Pathology, All India Institute of Speech and Hearing, Mysore. She is specialized in the area of speech and its disorders, specifically fluency and motor speech disorders. She has various publications to her credit. She has 16 years of clinical experience in working with individuals with communication disorders. She completed her PhD on fine grained auditory discrimination in children with learning disability at University of Mysore in 2005. She has also publications related to nonword repetition performance in typically and atypically developing children. She also contributes to teaching undergraduate and postgraduate students. Ms. Shylaja K. is a speech-language pathologist who earlier served as a Research Officer in the Department of Speech-Language Pathology, and is presently pursuing her Ph.D in same Department, AIISH, Mysore. She also has some publications in the area of nonword repetition to her credit.

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Chapter 1

Introduction

The Word and Nonword Repetition Test in Kannada (WNRT-K) has been designed to assess the phonological processing and memory abilities of children speaking Kannada, a South Indian Dravidian language. This test consists of two repetition tasks: (1) The word repetition test and (2) The nonword repetition test. The first task involves presentation of a set of real words or meaningful words and helps in assessing the phonological processing abilities and the knowledge of lexical phonology and the second task involves presentation of a set of nonwords or meaningless words and helps in assessing the phonological working memory. The test can be used to assess the age-appropriateness of phonological processing and memory skills, identify difficulties, inform intervention targets and monitor progress over time.

Test rationale

Repetition is a simple task that is informative about children's linguistic processing and representations. The task demands the children to repeat what the tester says, which provides information with regard to the child's phonological processing and phonological working memory abilities that is important for clinical assessment. The repetition of words and nonwords have been proposed as clinical markers for Specific Language Impairment (SLI) as it draws on these children's phonological skills. The repetition of single words (real words and nonwords) is also shown to be highly correlated with a variety of language measures in typically and atypically developing children.

For many years, researchers have tried to assess the capacity of the phonological working memory both in typically developing individuals and those with different communication disorders and the most widely used technique for this purpose has been the nonword repetition task. The nonword repetition task is thought to reflect some of the underlying cognitive difficulties, perhaps those concerned with working memory, phonological memory or long-term word knowledge (Gathercole, 1995).

The majority of studies involving nonword repetition in typical and atypical development have involved school-aged children. The studies on typically developing children aged 3-5 years have found correlations with receptive vocabulary and indices of speech output, including repertoire of vocabulary, utterance length and grammatical complexity (Gathercole & Baddeley, 1989; Gathercole, Willis, Emslie, & Baddeley, 1992; Gathercole & Adams, 1993; Michas & Henry, 1994; Adams & Gathercole, 1995, 2000). Other studies have found differences between groups of typically and atypically developing children, with children who have deficits in language also showing deficits in nonword repetition (Gathercole, 2006; Graf Estes, Evans, & Else-Quest, 2007). This finding has been replicated across a range of languages including Dutch (de Bree, Rispens, & Gerrits, 2007), Swedish (Sahlen, Wagner Nettelbladt, & Radeborg, 1999), Italian (Bortolini, Arfe, Caselli, Degasperi, Deevy, & Leonard, 2006), and Spanish (Girbau & Schwartz, 2007), and Indian languages (Shylaja & Swapna, 2010; Shylaja, Amulya, & Swapna, 2010), though not in Cantonese (Stokes, Wong, Fletcher, & Leonard, 2006).

Some studies have found that nonword repetition is a relatively reliable indicator of SLI (Bishop, North, & Donlan, 1996; Dollagahan & Campbell, 1998; Conti-Ramsden, Botting, Faragher, 2001), and even picks out children previously diagnosed with SLI but whose language difficulties appear to have resolved (Bishop et al., 1996; Conti-Ramsden et al., 2001). For these reasons, Bishop et al., and Conti-Ramsden et al. have proposed nonword repetition as a possible marker for SLI.

Consequently several tests incorporating the nonword repetition task have been published. Two widely used published nonword repetition tests in the West are the Children's Test of Nonword Repetition (CNRep; Gathercole & Baddeley, 1996), used mostly in the United Kingdom, and the Nonword Repetition Test (NRT; Dollaghan & Campbell, 1998) used more commonly in the United States (Archibald & Gathercole, 2006). Archibald and Gathercole (2006) stated that the CNRep and

the NRT may measure different abilities because of the small differences in the internal structure of the stimuli used and that the NRT, particularly focused on measuring phonological working memory.

However in the recent past, research has also focused on the repetition of words. A recent study (Casalini, Brizzolara, Chilosi, Cipriani, Marcolini, Pe[illegible], Ronoli, & Burani, 2007) investigated repetition of real words as well as nonwords, and found that children with SLI had significantly lower scores on both real words and nonwords compared to age-matched controls.

Accordingly Seeff-Gabriel, Chiat, and Roy (2008) incorporated the word repetition also and constructed a test named Early Repetition Battery (ERB) which consisted of two tasks viz. Preschool Repetition Test (PSRep) and Sentence Imitation Test (SIT). The PSRep involves the repetition of a set of real words and a set of nonwords which were designed to assess the phonological processing abilities of preschool children. According to them, the real word repetition assesses the phonological processing abilities and the knowledge of lexical phonology in forms that are expected to be familiar and stored in the child's mental lexicon and the nonword repetition measures the phonological memory.

In addition, many studies have found that performance on nonwords is influenced by their relation to words. Performance is better for items which are similar to real words, and for items containing phonotactic sequences that occur frequently in the language (Gathercole, 2006). This indicates that nonword repetition draws on and is informative about children's phonological processing and memory, their knowledge of lexical phonology. Real word repetition further assesses these abilities in forms that are expected to be familiar and stored in the child's mental lexicon.

Since the tests especially the NRT and PSRep have been found to be effective in identifying the phonological working memory and phonological processing deficits in children with various communication disorders, are quick and easy to administer, it is essential to construct such tests in other languages. This test of word and nonword repetition test for children in Kannada was devised for the same purpose, as a test of assessing the phonological processing and phonological working memory skills in children. Both real words and nonwords are included, because starting with real words makes it easier to introduce the repetition task to young children targeted by the test, and also to see whether children in these ages repeat words better than nonwords. This test provides a highly informative clinical and research tool for assessing these skills at word level in preschool children. This test can also be used to screen children who could be at risk for developing specific language impairment. In addition, assessing phonological working memory skills using nonwords in children with language impairment may also help us to predict whether the children might be at risk for specific language impairment and further have greater language and literacy deficits.

Test description

The WNRT-K consists of 10 practice items (5 words and 5 nonwords) and 80 test items (40 words and 40 nonwords), and takes approximately a total time of 10 minutes to administer, depending on the child's cooperation. The test items are 40 words and 40 nonwords, equally divided in length between two-, three-, four-, and five- syllable length items. Words and nonwords are phonologically matched in that nonwords were created by transposing or altering vowels and by transposing the syllables depending on the syllable lengths of the real words. The rules used to construct the nonwords differed for the words of different syllable length and were as follows:

- *Rules used for preparation of 2-syllable length nonwords:* The vowels of the original word were transposed or one of the vowels was replaced such that it formed a nonword in Kannada. For example, mane (word) to mena (nonword) or ni:li (word) to no:li (nonword) respectively.
- *Rules used for preparation of 3-syllable length nonwords:* The position of one of the syllable of the word was maintained and the other two syllables of the word were transposed, such that it formed a nonword in Kannada. For example, chappali (word) to lippacha (nonword).
- *Rules used for preparation of 4-syllable and 5-syllable length nonwords:* Three or four syllables were transposed in 4-syllable words and four or five syllables were transposed in five-syllable words to form a nonword in Kannada. For example, 4-syllable nonword:

malagide (word) to giladema (nonword), 5-syllable nonword: ma:vinamara (word) to ma:ravinama (nonword).

Scoring of the WNRT-K yields:

*a) **An accuracy measure:*** This comprises of the total number of items correctly repeated which is further broken down according to

1) Lexical status: Total number of words and total number of nonwords correct
2) Length: Total number of two-syllable, three-syllable, four-syllable and five-syllable items correct and
3) Phonemes correct: Total number and percentage of vowels and consonants repeated correctly, where in the percentage of vowels/consonants correct can be obtained by dividing the number of vowels/consonants correct by the total number of vowels/consonants multiplied by 100.

*b) **An error measure:*** This comprises of the type and frequency of errors namely substitution, omission, and addition errors calculated for each word and nonword repeated. The total percentage of different errors can be calculated by dividing the number of a particular type of error by the total number of syllables multiplied by 100.

Test uses and users

Client group

The WNRT-K is intended for use with children between the ages of four years to six years. The test is also recommended to be used with older children with persistent language difficulties or language delay. This test has been standardized on children who have Kannada as their first language. This should be taken into account if the WNRT-K is used with children for whom Kannada is not the first language or main language.

The information obtained from administering the WNRT-K should be considered together with results of other assessments to provide a full profile of a child's abilities.

Uses

The WNRT-K can be used on three levels, depending on the purposes of the assessment. Level 1 is used to identify children for referral and as the first step of a speech and language assessment. Levels 2 and 3 analyze performance in greater depth, to identify areas of strengths and difficulties to perform intervention. Figure 1.1 summarizes the three levels and indicates the tables required for scoring at each level.

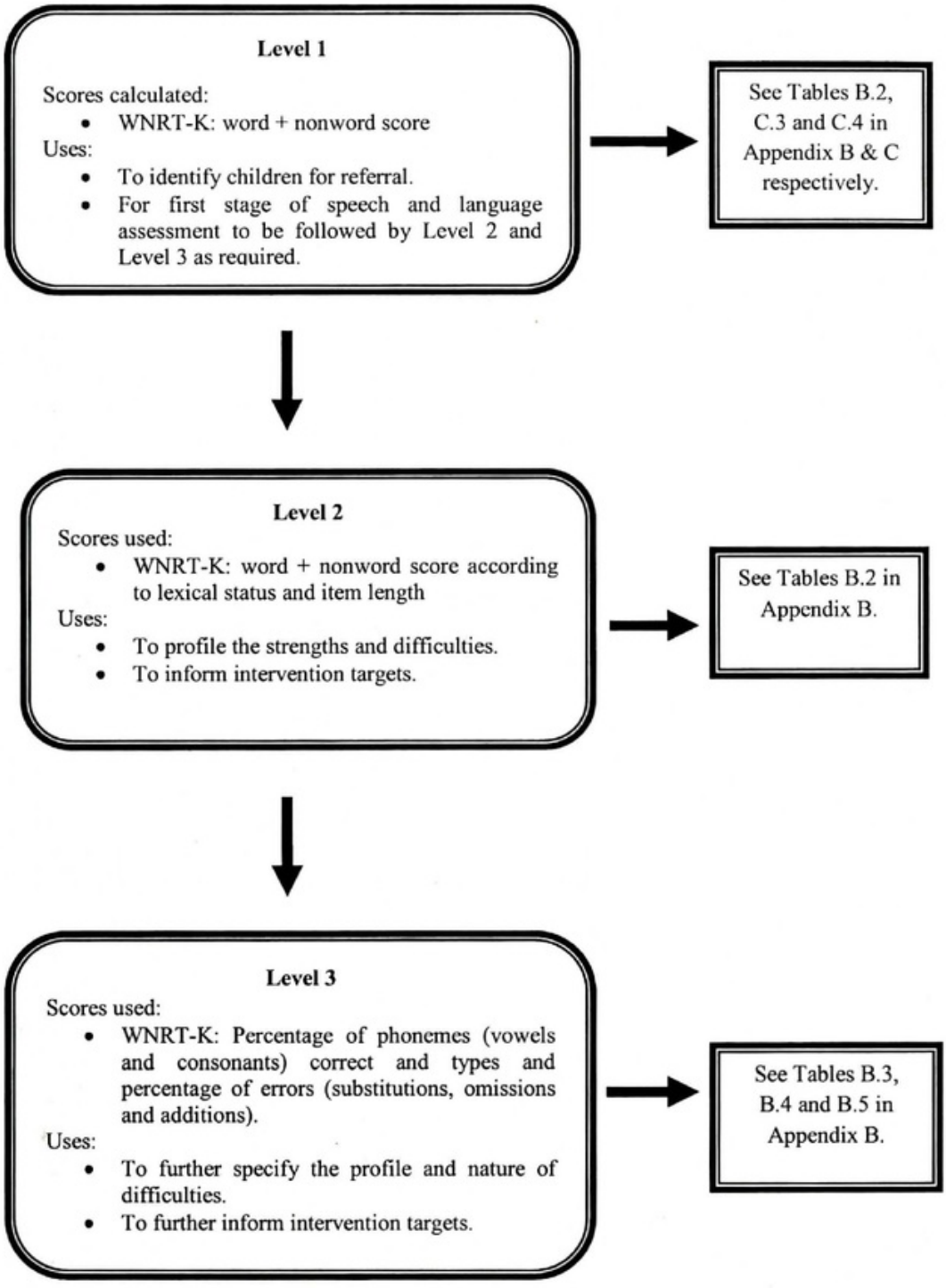

Figure 1.1. *Summary of levels of interpretation in WNRT-K.*

Professional users

This test was designed to be used primarily by Speech and Language Pathologists/Therapists (SLP's/SLT's) to assess children's phonological processing and phonological working memory abilities. SLP's have specific training and skills in linguistics and phonetics that are essential for full analysis of performance on the WNRT-K.

The WNRT-K can also be used by other professionals including regular and special educators to identify children for referral to speech and language assessment and therapy services, as only Level 1 analysis is required for this purpose which does not require specific training and skills. However if children have speech problems that make scoring difficult, it may be necessary to seek the advice of the SLP's/SLT's.

Advantages of the test

- Repetition is a task that is simple and easy for even young children to understand.
- The tester can analyze the responses of the child easily as the target words are pre-specified.
- The test is easy to administer and can be used in different ways depending on the purpose of assessment and the level of expertise of the tester.
- Higher levels of analysis enable the tester to identify areas of strengths and weaknesses of children and assist in the selection of intervention targets.

Chapter 2

Administration and Scoring

General guidelines for administration of the test

(i) Prior to administration, familiarize yourself with the words and nonwords included in the test.
(ii) Ensure that you have all the necessary materials including a score sheet, a pen to score the responses and a laptop/desktop computer with headphones to present the stimuli and record the child's responses in order to score them, for example, if the child appears to have speech difficulties.
(iii) Ideally, the test should be carried out in a quiet room, free of distractions. The stimuli should be presented through headphones auditorily at comfortable listening level to the individual participants.

- Present the practice items sufficient number of times so as to familiarize the child with the task before presenting the test items.
- Administer the entire list of test stimuli (words and nonwords) without stopping in between, even if the child does not respond to the initial few items.
- Praise the child regardless of accuracy of response, with no indication as to whether the response was right or wrong.
- The WNRT-K can be used to monitor any change or progress in the child's condition. We recommend re-administering the test after 3 to 6 months, depending on the age and developmental level of the child.

Administration

Introducing the test to the child

Instruct each child you test as following depending on the task: "You are going to hear some words. Your job is to say them back to me, exactly the way you hear them. Some of the words will be short, and others will be longer. Listen carefully, because you will be hearing the words only once. Here comes the first word."

Administering the practice items

Present the five practice items for words / nonwords depending on the task. If the child responds, then proceed with the test items. If the child does not respond at all to the first presentation, give up to two to three further presentations. The aim of this practice is to familiarize the child with the task. You can record the child's responses, but correct responses are not required to proceed to the test items.

Where to start

Begin administering the test from the first item in the 'words' set, irrespective of the child's age.

How to continue

At the end of the 'word' set, introduce the nonwords from the 'nonword' set along the following lines:

"You are going to hear some funny words. Your job is to say them back to me, exactly the way you hear them. Some of the words will be short, and others will be longer. Listen carefully, because you will be hearing the funny words only once. Here comes the first word."

Present the five practice nonwords, giving up to two further presentations if the child does not respond to the first. Again, the aim of this practice is to familiarize the child with the task. You

can record the child's responses, but correct responses are not required to proceed to the test items. Administer the test items in the nonword set by following the procedure used to administer test items in the word set.

When to discontinue

The test items are arranged randomly and not set out in order of difficulty. The aim is to present all items even if the child makes a number of consecutive nonresponses or errors. In our experience, children may respond after refusing several items, so you should continue to the end of the test unless the child refuses to cooperate.

Scoring

As far as possible, score responses online.

- Score the first response to each item, unless the child spontaneously self-corrects, in which case score the self-corrected response.
- In the columns headed 'score' in the word and nonword score sheet (see Appendix A),
  -Tick or circle '1' if the child repeats correctly all the syllables in a word and a nonword, as matched to the target,
  -Tick or circle '0' if the child repeats the item incorrectly
  -Tick or circle 'No Response (NR)' if the child does not attempt the item.

(See the sample score sheet of a client with language impairment on page nos. 12 to 15 for reference)

See below for scoring criteria.

- In case a child's response is incorrect, transcribe the response in the column headed 'transcription' in the word and nonword score sheet (Appendix A). If you are not trained in phonetic transcription, use English script to record the child's response as clearly as possible.
- Use the space provided in the score sheet to note the typical and unusual phonological processes present in the child's responses.

Criteria for scoring responses as correct or incorrect

Score an item as correct if it contains all the target phonemes, in the correct order and if the meaning of the word remains unchanged, with the following allowances:

- Omissions and substitutions which are judged to be appropriate in the child's dialect, e.g., /tagijo:du/ for /tagijuvudu/; /no:dtidda:ne/ for /no:duttidda:ne/. In this example, though there is omission of a syllable/phoneme, the meaning of the word remained the same and hence it can be scored as correct. Another instance - /mi:nugolu/ for /mi:nugalu/ can be scored as correct if this word is used in the child's dialect. Consistent production of /s/ for /S/ by the typically developing child due to the rural influence on language can also be scored as correct.
- Substitutions which are consistent due to the normal phonological processes such as fronting, stopping, gliding are scored as correct, e.g., /l/ for /L/ consistently as in /kannadigalu/ for /kannadigaLu/, /balegalu/ for /baLegaLu/ etc; /l/ for /r/ consistently as in /belaLu/ for /beraLu/, /mavinamala/ for /mavinamara/ etc., can be scored as correct.
- Distortions of syllables are scored as correct responses.
- Consistent articulatory errors can be scored as correct in children with speech and language impairment.

Calculating raw scores: Level 1

Add up the number of items with scores '1' in the word score sheet and the nonword score sheet. Enter subtotals in the boxes at the foot of the columns and copy the word scores into the

appropriate boxes on the nonword score sheet. Enter total word + nonword score in the boxes at the foot of the nonword score sheet.

Obtaining the percentile scores: Level 1

Percentile scores for words and nonwords combined are shown in Appendix C (Table C.3). Scores are provided for 4-5 years and 5-6years age groups. To obtain the percentile score, find the child's raw score in the Table C.3 in appendix C and then find the corresponding percentile score. Next interpret the performance of the child based on the ranks provided in Table C.4 (Appendix C). For example, a raw score for word + nonword score of 60 for a child aged 4.6 years yields a percentile range of 10-25. Then move on to the interpretation of the percentile ranks (Table C.4) and then find the appropriate classification of the percentile score, for e.g., the percentile of 10-25 yields an interpretation of 'poor performance'.

Comparing scores with the mean according to lexical status and item length: Level 2

Accuracy scores may be broken down further according to lexical status and item length:

To calculate scores according to lexical status

Look for the total word score and the total nonword score as obtained in level 1. Calculate the percentile score as mentioned under level 1 by referring to Table C.1 for words and C.2 for nonwords and C.4 for the interpretation.

To calculate scores according to item length

- Enter 1 (Correct) or 0 (Incorrect or NR) in the blank box allocated to each item in the column headed 'score' by item length as illustrated in sample score sheet provided on page no. 12 and 13.
- Add up scores in the column headed 2sy, 3sy, 4sy, and 5sy, and enter the subtotals in the boxes at the foot of the column headed 'score by item length' on the word score sheet and nonword score sheet. Further refer to Table B.1 (see Appendix B) and use the procedure to compare the child's score with the mean as mentioned below.
- To obtain the total word + nonword scores according to the item length and lexical status, add up scores in the column headed 2sy, 3sy, 4sy, and 5sy, and enter the subtotals in the boxes at the foot of the column headed 'score by item length' on the word score sheet and nonword score sheet. Then copy the word scores into the appropriate boxes on the nonword score sheet. Calculate total word + nonword scores for each syllable length and enter at the foot of the nonword score sheet. Refer to Table B.2 (see Appendix B) and use the procedure to compare the child's score with the mean as mentioned below.

Procedure to compare child's score with the mean

To determine whether scores obtained on word and nonword task for each syllable length fall within the normal range, refer to the relevant tables specified above (Table B.1 for words and nonwords separately and table B.2 for combined scores). Find the column corresponding to the child's age and subtract the standard deviation from the mean score. Score less than this are outside the normal range. Scores greater than this or equal to this number are within the normal range.

Calculating percentage of phonemes correct and percentage of different error types: Level 3

Percentage of *phonemes (vowels and consonants) correct*

- Count and enter the number of vowels and consonants repeated correctly for each word in the blank box allocated to each item in the column headed 'No. vowels correct' and 'No. consonants correct'.

- Add up scores in the column headed 2sy, 3sy, 4sy, and 5sy, and enter the subtotals in the boxes at the foot of the column headed 'No. vowels correct' and 'No. consonants correct' on the word score sheet and nonword score sheet.
- Further convert the total number of vowels and consonants repeated correctly at each syllable length and also in total into percentage of vowels and consonants repeated correctly, where in the percentage of vowels/consonants correct can be obtained by dividing the number of vowels/consonants correct by the total number of vowels/consonants multiplied by 100. Subsequently refer to Table B.3 and B.4 (see Appendix B) and use the procedure to compare the child's score with the mean as mentioned earlier.

Percentage of different error types

- Enter the number of syllables substituted, omitted, or added for each word and nonword at their respective syllable lengths in the column headed 'No. syllable substitutions', 'No. syllable omissions', and 'No. syllable additions' in the score sheet titled 'types of syllable errors' in the word and nonword score sheet: types of syllable errors'. Refer to page no. 14 and 15, for an illustration of a client with language impairment.
- Add up scores in the column headed 2sy, 3sy, 4sy, and 5sy, and enter the subtotals in the boxes at the foot of the column headed 'No. syllable substitutions', No. syllable omissions', and 'No. syllable additions' on the 'types of syllable errors' part of word score sheet and nonword score sheet.
- Further convert the total number of syllable substitutions, omissions and additions at each syllable length and also in total, into percentage of syllables substituted/omitted/added, by dividing the number of syllables substituted/omitted/added by the total number of syllables multiplied by 100. Subsequently refer to Table B.5 (see Appendix B) and use the procedure to compare the child's score with the mean as mentioned earlier.

Chapter 3

Interpretation

Interpreting percentile ranks

Table 3.1 depicts the percentile scores for the words and nonwords combined for both the age groups. This can be used to calculate the percentile score of a child.

Table 3.1. *Percentile scores for overall word and nonword accuracy for both age groups.*

Percentile scores	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

The 5th percentile indicates that only 5% of the children are scoring less than 56.70 and 61.95 in the 4-5years and 5-6years age group respectively in the overall task of word and nonword repetition. The 50th percentile is the score below which 50% of the scores in the standardization sample fall i.e., 50% of the standardization sample in 4-5years and 5-6years score less than 71.50 and 74.0 respectively. The Table 3.2 below outlines the terms most commonly used to classify percentile ranks. This can be used as a guide for identifying the existence and severity of difficulties.

Table 3.2. *Interpretation of the percentile ranks.*

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

The average or normal range of performance lies between the 50th and 89th percentile scores. Children's score falling between 5th-49th percentiles constitutes poor performance and indicate that the children are having difficulties with this test. The children whose scores fall between 90th-100th percentiles are considered as above average performers in the present test.

Interpreting WNRT-K

The WNRT-K is designed as a measure of children's phonological processing and phonological working memory: their ability to discriminate, remember, and immediately produce the segmental details within the test item. A score in the normal range indicates that the child has normal phonological processing and phonological working memory skills. Thus, children with WNRT-K scores in the normal range are at low risk for difficulties with the forms and structures of language.

Low scores may result from a number of different problems and are open to different interpretations.

Interpreting low scores

Low scores on this test may reflect deficits in the phonological processing and phonological working memory skills targeted by the test. However, the test also requires peripheral processing skills of:

- Hearing
- Speech planning and execution

If hearing has not been checked, the possibility of hearing impairment must be considered. If the child is found to have a hearing impairment, standard scores on the WNRT-K are not informative. However, the test may be used to obtain qualitative information about the child's phonology.

Speech production difficulties that result in consistent substitutions (for example, stopping for fricatives and fronting of velars) will not affect a child's score, since scoring allows for such substitutions (see criteria for scoring responses as correct/incorrect on page no. 7). However, some speech production difficulties result in inconsistent errors which will be scored as incorrect on the test. Low scores may arise from this type of speech production problem. Further assessment is needed in order to distinguish this type of speech problem from problems with phonological processing and phonological working memory.

Unreliable test result

If you suspect that the child's low test score does not reflect his/her true ability, the test should be re-administered within 1-2 weeks to determine whether the original result was reliable. In addition the test results should be interpreted along with further detailed results of other assessment procedures.

Case Study
WORD SCORE SHEET

Practice Items	Number of Presentations	Discontinue Rule	Accuracy & Error analysis
1. ʤaʈe 2. ɳaviʤu 3. bhaːɳuvaːra 4. meʈʈiʤugaʌu 5. bataːnigaʌu Correct responses are not required to proceed to the test items.	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 words correct and also number of words 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 word 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 scores 0, transcribe response in the space provided. 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.

N	Target	Score			Transcription	Score by item length				No. vowels correct				No. consonants correct			
						2sy	3sy	4sy	5sy	2sy	3sy	4sy	5sy	2sy	3sy	4sy	5sy
1	maɳe	1	0	NR		1				2				2			
2	ʧappaʌi	1	0	NR			1				3				3		
3	ʈaraka:ri	1	0	NR				1				4				4	
4	ʧamaʧagaʌu	1	0	NR					1				5				5
5	ʧa:pe	1	0	NR		1				2				2			
6	kaʈʈaʌe	1	0	NR			1				3				3		
7	garagasa	1	0	NR				1				4				4	
8	vima:ɳagaʌu	1	0	NR	vina:gaʌu				0				4				3
9	ɳi:ʌi	1	0	NR		1				2				2			
10	ʈabaʌa	1	0	NR			1				3				3		
11	maɳejaʌʌi	1	0	NR				1				4				4	
12	ʧiraʈegaʌu	1	0	NR					1				5				5
13	ɖa:ra	1	0	NR		1				2				2			
14	kaɖime	1	0	NR			1				3				3		
15	ɖi:pagaʌu	1	0	NR				1				4				4	
16	ɳo:ɖuʈiɖɖa:ɳe	1	0	NR					1				5				5
17	beɳɳu	1	0	NR		1				2				2			
18	ʈakkaɖi	1	0	NR			1				3				3		
19	maʌagiɖe	1	0	NR				1				4				4	
20	baʌapagaʌu	1	0	NR	baʌapagaʌu				0				5				3
21	mi:ɳu	1	0	NR		1				2				2			
22	ʧapa:ʈi	1	0	NR	ʧapa:ʈu		0				2				3		
23	ʃaɳiva:ra	1	0	NR				1				4				4	
24	ma:viɳamara	1	0	NR					1				5				5
25	waɖe	1	0	NR		1				2				2			
26	ʧakkuʌi	1	0	NR			1				3				3		
27	maɳegaʌu	1	0	NR	manegaʌu			0				4				3	
28	kuɖuregaʌu	1	0	NR					1				5				5
29	ɖi:pa	1	0	NR		1				2				2			
30	basava	1	0	NR			1				3				3		
31	bi:gagaʌu	1	0	NR				1				4				4	
32	ʈagijuvuɖu	1	0	NR					1				5				5
33	ka:ge	1	0	NR		1				2				2			
34	gaɳe:ʃa	1	0	NR			1				3				3		
35	baʌegaʌu	1	0	NR	baʌegaʌu			0				4				2	
36	kaɳɳaɖigaʌu	1	0	NR	kannaɖigoʌu				0				5				4
37	ba:ji	1	0	NR		1				2				2			
38	beraʌu	1	0	NR	beraʌu		0				3				2		
39	maragaʌu	1	0	NR				1				4				4	
40	baɖaɳeka:ji	1	0	NR					1				5				5
	Word total	40	33	0		10/10	8 /10	8 /10	7/10	20 /20	29 /30	40 /40	49/50	20/20	29/30	37 /40	45/50
										100%	96.7%	100%	98%	100%	96.7 %	92.5 %	90%
						33/40				138/140				131/140			
										98.57 %				93.57 %			

NONWORD SCORE SHEET

Practice Items	Number of Presentations	Discontinue Rule	Accuracy & Error analysis
1. ʈeʈʈa 2. ɳaɭuvi 3. va:bha:ɳura 4. ɭuʈʈiɭugame 5. ʈa:baɭuɳiga Correct responses are not required to proceed to the test items.	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 scores 0, transcribe response in the space provided. 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	Score by item length				No. vowels correct				No. consonants correct			
						2sy	3sy	4sy	5sy	2sy	3sy	4sy	5sy	2sy	3sy	4sy	5sy
1	mena	1	0	NR		1				2				2			
2	ʝippaʈa	1	0	NR			1				3				3		
3	raka:ʈari	1	0	NR	raka:ʈaɭi			0				4				3	
4	ʧagaɭumaʈa	1	0	NR	ʧabaɭugaʈa				0				5				3
5	ʧe:pa	1	0	NR		1				2				2			
6	ʝeʝaka	1	0	NR			1				3				3		
7	ga rasaga	1	0	NR				1				4				4	
8	ma:ʝuvigana	1	0	NR	ma:ʝuvigaɭa				0				5				4
9	ɲo:ʝi	1	0	NR		1				2				2			
10	ʝabaʈa	1	0	NR			1				3				3		
11	ʝaʎʎipea	1	0	NR				1				4				4	
12	ʧiɭuteraga	1	0	NR	ʧiɭuteraga				0				5				4
13	ɖe:ra	1	0	NR		1				2				2			
14	ɖikame	1	0	NR	ɖipame		0				3				2		
15	paɖi:gaɭu	1	0	NR	paɖi:gaɭu			0				4				3	
16	ɲo:ɲineɖɖa:ɖu	1	0	NR	ɲo:ɲiɖɖa:ɖu				0				4				4
17	buɳɳe	1	0	NR		1				2				2			
18	ɖikkaʈa	1	0	NR			1				3				3		
19	giɭaɖema	1	0	NR				1				4				4	
20	pabaɭugaɭa	1	0	NR	pabaguɡaɭa				0				4				3
21	mu:ɳi	1	0	NR		1				2				2			
22	ɲipa:ʧa	1	0	NR			1				3				3		
23	ɲiva:ʃara	1	0	NR				1				4				4	
24	ma:raviɳama	1	0	NR					1				5				5
25	weɖa	1	0	NR	wela	0				2				1			
26	ʝikkuʈa	1	0	NR			1				3				3		
27	maɭuneɡa	1	0	NR				1				4				4	
28	gareɻukuɖu	1	0	NR	daleɻukuɖu				0				5				3
29	ɖa:pi	1	0	NR		1				2				2			
30	Sabava	1	0	NR			1				3				3		
31	gabi:ɭuga	1	0	NR	gabi:ɭuga			0				4				3	
32	ɖugiʝuʇavu	1	0	NR	ɖugiɖuʇagu				0				5				3
33	ke:ga	1	0	NR		1				2				2			
34	ʃaɲe:ga	1	0	NR			1				3				3		
35	galebaɭu	1	0	NR	galegaɭu			0				4				2	
36	diɲnakagaɭu	1	0	NR	ɖiɲnakaɭu				0				4				3
37	bi:ja	1	0	NR		1				2				2			
38	beɻura	1	0	NR	beɻura		0				3				2		
39	maɭugara	1	0	NR	maɭugaɭa			0				4				3	
40	ɖabaka:ɲei	1	0	NR	ɖabaka:ɲij				0				4				5
	Nonword total	**40**	**23**	**0**		9 /10	8 /10	5/10	1/10	20/20	30 /30	40 /40	46/50	20/20	28/30	35/40	37/50
	Word total	**40**	33	0						100%	100%	100%	92 %	100 %	93.3%	87.%	74%
	Word + Nonword Score	**80**	**56**	**0**		23 /40				136 /140 97.1 %				120/140 85.7 %			

WORD SCORE SHEET: TYPES OF SYLLABLE ERRORS

No.	Word Response Transcribed	No. Syllable Substitutions				No. Syllable Omissions				No. Syllable Additions				Phonological processes
		2sy	3sy	4sy	5sy	2sy	3sy	4sy	5sy	2sy	3sy	4sy	5sy	
1														
2														
3														
4														
5														
6														
7														
8	vina:gaḷu				1				1					
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
19														
20	baḷapagaḷu				2									
21														
22	ʧapa:ṭu		1											
23														
24														
25														
26														
27	manegaḷu			1										
28														
29														
30														
31														
32														
33														
34														
35	baḷegaḷu			2										
36	kannaḍigoḷu				1									
37														
38	beraḷu		1											
39														
40														
		0/20	2/30	3/40	3/50	0/20	0/30	0/40	1/50	0/20	0/30	0/40	0/50	
		8/140				1/140				0/140				
		5.71%				0.71%				0%				

NONWORD SCORE SHEET: TYPES OF SYLLABLE ERRORS

No.	Nonword Response Transcribed	No. Syllable Substitutions				No. Syllable Omissions				No. Syllable Additions				Phonological processes
		2sy	3sy	4sy	5sy	2sy	3sy	4sy	5sy	2sy	3sy	4sy	5sy	
1														
2														
3	raka:ʈali			1										
4	ʧabaɭugatʃa				2									
5														
6														
7														
8	ma:ɭuvigaɭa				1									
9														
10														
11														
12	ʧiɭuʈeraga				1									
13														
14	ɖipame		1											
15	paɖi:gaɭu			1										
16	ɲo:ʈiɖɖa:ɖu								1					
17														
18														
19														
20	pabugugaɭa				3									
21														
22														
23														
24														
25	wela	1												
26														
27														
28	daleɭukuɖu				2									
29														
30														
31	gabi:ɭuga			1										
32	ɖugiɖuʈagu				2									
33														
34														
35	gaɭegaɭu			1										
36	ɖiɲɲakaɭu				1				1					
37														
38	beɭura		1											
39	maɭugaɭa			1										
40	ɖabaka:ɳiji				1									
		1/20	2/30	5/40	13/50	0/20	0/30	0/40	2/50	0/20	0/30	0/40	0/50	
		21/140				2/140				0/140				
		15%				1.42%				0%				

Chapter 4

Technical Information

Sampling procedure

A total of one hundred and thirty eight typically developing Kannada speaking children with chronological age ranging between 4 to 6 years served as participants for the study. They were divided into two groups which included sixty six children (thirty four females and thirty two males) in 4-5years and seventy two children (forty two females and thirty males) in the age range of 5-6years. The children in both the groups were selected from around ten different schools in Mysore district of Karnataka and were learning English as their second language in school. They were divided into lower, mid, and higher socioeconomic status categories using Socio Economic Scale by Venkatesan (2009). In addition the WHO Ten-question disability screening checklist (Singhi, Kumar, Malhi, & Kumar, 2007) was administered to rule out any disability. The subjects were randomly selected from within the ten different schools and three different socio-economic status groups to ensure the representativeness of the sample. The participants with no evidence of sensory, neurological, oro-motor, social-emotional, cognitive, behavioral, speech-language or learning deficits were selected. Ethical procedures were used to select the participants. The school principal and parents were explained the purpose and the procedures of the study and an informed verbal and written consent were taken.

The study was carried out in three phases: Phase I included the construction of the word and the nonword repetition test in Kannada, phase II included the standardization of the word and nonword repetition test and phase III included the establishment of the validity of the test.

Phase I: Construction of the word and the nonword repetition test in Kannada

The real words of varying syllable lengths (2syllable, 3syllable, 4syllable and 5syllable length) were selected from Computerized Linguistic Protocol (in Kannada) for Screening Children (CLIPS) (Anitha & Prema, 2008), With a little bit of help-Early Language Training Manual (Karanth, Manjula, Prema, & Geetha, 1999) and also from the Kannada text books of school children of 4-6years. The words selected were ensured to be within the vocabulary of the children. A total of 80 meaningful words were selected and different rules were applied to create 'nonwords'. The list of the nonwords was developed based on the following criteria:

1. The nonwords constructed were such that none of their individual syllables (CV or CVC) corresponded to a Kannada word. This was done to ensure that the nonwords included were not affected by a subject's vocabulary knowledge.
2. The nonwords contained sounds that were within the phonetic inventory of the children selected.
3. The nonwords did not include consonant clusters.
4. The consonants of the original word were maintained.
5. The nonwords developed followed the phonotactic rules of the Kannada language.

The rules used to construct the nonwords differed for the words of different syllable length and were as follows:

Rules used for preparation of 2-syllable length nonwords: The vowels of the original word were transposed or one of the vowels was replaced such that it formed a nonword in Kannada. For example, mane (word) to mena (nonword) or ni:li (word) to no:li (nonword) respectively.

Rules used for preparation of 3-syllable length nonwords: The position of one of the syllable of the word was maintained and the other two syllables of the word were transposed, such that it formed a nonword in Kannada. For example, chappali (word) to lippacha (nonword).

Rules used for preparation of 4-syllable and 5-syllable length nonwords: Three or four syllables were transposed in 4-syllable words and four or five syllables were transposed in five-syllable words to form a nonword in Kannada. For example, 4-syllable nonword: malagide (word) to giladema (nonword), 5-syllable nonword: ma:vinamara (word) to ma:ravinama (nonword).

These 80 words and nonwords prepared were subjected to a judgement on word-likeliness on a 4-point rating scale by five adult native speakers of Kannada, with '3' denoting the highest degree (100%) of word-likeliness and '0' denoting least degree (not at all similar to any meaningful Kannada word) of word-likeliness. The words which were rated with a point of '0' or '1' were included in the final list of nonwords, ten at each of the 2-syllable length, 3-syllable length, 4-syllable length and 5-syllable length. All the stimuli began with a consonant and ended with a vowel. The syllable structure for the two-, three-, four-, and five- syllable nonwords were CVCV/CVCCV, CVCVCV/CVCCVCV, CVCVCVCV/CVCCVCVCV, and CVCVCVCVCV/ CVCVCVCCVCV/ CVCCVCVCVCV respectively.

The final list of 40 words, 40 nonwords (test items) and 5 words and 5 nonwords as practice items were then audio-recorded by a female native speaker of Kannada using the "PRAAT" software (downloadable software for speech recording and analysis) using a Compaq Presario C 700 laptop system.

Phase II: Standardization of the word and nonword repetition test

Procedure: A pilot study was carried out by administering the initially developed list of 80 words and 80 nonwords to 10 children in each age group to evaluate which of the words and nonwords could be easily repeated. Further the first 40 nonwords which could be repeated easily out of the total 80 nonwords were selected and also the corresponding 40 words were included to the final list. The final list consisted of a total of 80 test items with 40 words, 40 nonwords and 10 practice items including 5 words and 5 nonwords.

Following this, the list of recorded words and nonwords along with 10 practice items were presented to the subjects selected for the study. These were presented as wave file through headphones auditorily at comfortable listening level to the individual participants, in a quiet listening environment. Each participant was given the instructions as following depending on the task: "You are going to hear some words. Your job is to say them back to me, exactly the way you hear them. Some of the words will be short, and others will be longer. Listen carefully, because you will be hearing the words only once. Here comes the first word." The list of practice items followed by the test items was presented. No prompting or cueing was presented regarding the accuracy of the child's production during the testing. The words and nonwords were randomized and presented and their responses were audio recorded. The total time taken to complete the repetition test was 10 minutes. They were given tangible reinforcements as a token of appreciation for their efforts.

The reliability was established as a part of standardization. Test-retest reliability was established for 10% of the subjects selected for the study from each age group. They were tested within a span of one to two weeks. The inter-rater reliability was established by administering the entire test on 10% of the population wherein the responses were analyzed by two qualified speech-language pathologists.

Phase III: Establishment of validity

The validity of the test was established by administering the test to 10 other typically developing children in each age group who did not belong to the previous group who were selected for the study and 5 children with language impairment. The test administration was carried out in a similar manner as mentioned above.

Derivation of norms

The mean and standard deviation (SD) values were computed for children in both the age groups and across gender. The mean and SD scores were computed for the accuracy of word and nonword

1-Word and Non-Word Repetition Test in Kannada

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