Tests Screening Reading Difficulty in Malayalam among Upper Primary School Boys

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Abstract

Design of a screening test for identifying reading difficult students in Malayalam and validation thereof among boys is made to help schools proactively intervene with such students. A battery of tests developed based on extant literature on screening tests, reviewed difficulties in reading Malayalam, and discrimination power of the draft tests is used. 98 Reading Difficult and 327 Normal Readers in grade 5 to 7 were identified with fourfold criterion. Scored by cut-points, the battery of tests on letter pronunciation, letter sound recognition, initial sound fluency, word recognition, phoneme segmentation, word fluency, oral reading, and hearing comprehension significantly screen upper primary reading difficult boys with around 90% sensitivity and specificity.

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Reading is essential for learning. It is the centre piece of the elementary school curriculum. Learning to read is the most important work of students in early elementary grades. It is the door to vistas of knowledge in school and beyond. Failure with reading puts students at-risk to achieve in future learning and in understanding across other areas of the curriculum. Reading is closely linked to other aspects of languages, like oral language, speaking and writing. Theory and research on reading development, and on its risk factors and their measurement, are relatively strong. Yet, students fail to learn reading for a variety of internal and external reasons. Students who fail to read are described in different ways. Educationists and mostly educational psychologists use the term specific learning difficulties (SLD) for a diverse group of children, for a range of difficulties with learning problems, and for variety of conditions in area of reading and writing. Generally, the term dyslexia is used by clinicians and voluntary organizations to denote some specific deviant conditions. While an increasing proportion of children in school are learning disabled, approximately 85 percent of children diagnosed with learning difficulties have a primary problem with reading and related skills. The proportion of students with reading problems ranges from 15 to 20 percent (Supple & Whyte, 1995). Despite this, once students move into the higher grades, formal reading instruction ceases and reading becomes the means by which students learn content. In languages like Malayalam where native language users depend predominantly on English during postsecondary education, such difficulties persists well beyond schools, as evidenced from finding that would-be secondary teachers are unable to attain the one by forth of the competency in Malayalam; with especially poor performance (43%) on reading comprehension (Gafoor & SujilaRani, 2013).

Schools need not wait for students to fail before coming to their assistance. Instead, they can screen all students to identify those on path to failure. Predicting reading difficulty (RD) is valuable in providing preventive interventions. Clearly, such screening need be conducted with all students (Jenkins & Johnson, 2011), though they can be targeted on those at-risk too. Such screening tests are constructed on the premise that many students fail to develop the prerequisite skills and knowledge required to become good readers. Since poor readers who do not receive early intervention tend to fall further behind their peers (Stanovich, 2008) and given

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the importance of early intervention, plus the importance of reading across the curriculum and grade levels, students who require intervention need to be identified early in school. Screening help improve student learning by intervening early with students at-risk for academic difficulty, allocating instructional resources accordingly, providing high-quality instruction, and identifying students whose RD stem from experiential and instructional deficits. Screening test for RD is required in all languages which a substantial number of learners depend for schooling and hence personal development.   However, optimal methods for screening for speech and language delay have not been identified, and screening is practiced inconsistently. Most of the evaluations, even in developed counties and in languages such as English are not designed for screening purposes, and the instruments measured different domains and study populations (Nelson, Nygren, Walker, & Panoscha, 2006). This clearly evidences the value of attempting screening tests for RD in Malayalam, a language spoken by nearly 40 million people world over.

Potential factors in Reading Difficulty and Its Identification

Children first acquire elementary decoding skills, and then gradually apply these skills with greater accuracy and speed, leading to an increasingly automated process that recognizes multi-letter units (consonant clusters, syllables, and morphemes) and whole words (Ehri, 2005). The precursor reading skills such as phonological awareness and rapid naming are highly predictive of word reading, i.e., word recognition (Muthen, Francis, & Baker, 2008). Focal variables involved in reading development are phonological awareness, naming speed, orthographic knowledge, and morphological awareness (Roman et al., 2009). Syntactic awareness was found to be important for word reading and spelling abilities especially of first language learning (Vehoeven & Siegal, 2007). Word identification, whether the reader can pronounce words clearly, is a necessary but not sufficient factor for comprehension. Visual processes initiate word identification and immediately trigger other processes that complete it, including, phonological decoding processes. Studies demonstrate strong and specific relationship between phonological awareness and early acquisition of reading (Bradley & Bryant, 1983; Bryant, MacLean, & Bradley, 1990; Wagner & Torgesen, 1987). Phonological awareness promotes children's understanding of the relationship between speech and alphabetic orthography. The importance of morphological knowledge for reading increases over the school years, (Carlisle, 2000) with significant contribution to the reading comprehension in both English and Chinese for second, fourth, and sixth graders (Kuo & Anderson, 2006).

Phonological decoding concerns the correspondence between printed letters and the sounds of the language, especially phonemes. Learning, as a language based activity, is fundamentally and profoundly dependent on vocabulary knowledge (Baker, Simmons, & Kame'enui, 1998). Comprehension can be measured using meaning of words, basic meaning of text, making inferences from text and on the accuracy and speed of their identification of strings of letters as words such as decoding familiar, unfamiliar and pseudo words. Poor comprehenders are less sensitive to abstract semantic association between words because of reduced gist memory (Weeks & Hamilton, 2008). Morphological awareness between grade 3 and 5 affected reading comprehension (Kirby, Geier, & Deacon, 2009). Knowledge of word meanings is important for comprehension with vocabulary knowledge as measured by standardized tests being a major correlate of it (Davis, 1968). Lack of relevant word knowledge diminishes word meanings (Anderson and Freebody, 1983).

RD can be observed as difficulty with, either or both, latent abilities and expressive abilities in language. The common and easily observable features used for identifying SLD include the significant discrepancy between verbal and written performance, misreading when copying or taking notes, trouble in following a sequence or keeping pace when reading, problems in ordering things sequentially, and persistent or severe problems with spelling (Department of Psychology University of Kentucky UK, 2003). Some typical SLD reading

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mistakes include reading very slowly and showing hesitations, following list with fingers, and losing places by missing word chunks (Politt, Pollock, & Waller, 2004). Children with RD face difficulties in speed of work, copying from board, reading and dictation problems in school (Riddick, 2009). Especially in primary age, RD children confuse left and right, and have difficulty in pronouncing words too (Miles & Miles, 1999). Discrepancy between the different tasks in reading and writing and school achievements diagnose children with RD.

To read well, children generally require strong receptive and expressive language, well-developed phonological and print awareness, knowledge of letter–sound relationships (decoding), large vocabularies, ability to read naturally and effortlessly with fluency, and ability to comprehend what they read (Lonigan & Shanahan, 2009). The students with problems in reading related areas can have difficulty in two latent and less apparent sub-processes, word recognition and reading comprehension. Problem in word recognition process is exhibited as difficulty in acquiring the identities, sounds and written forms of individual letters. Even if the child acquires letter sound, difficulty in applying the letter sounds to the decoding of unfamiliar forms is possible. Children, who can recognise words and say it, may have difficulty with the learning to link the words to their meanings. Comprehension of language is examined by methods including ability to copy, ability to take dictation, ability to assess the accuracy of spelling and speed, and free writing.

In kindergarten, children with noticeable reading and writing problems are slow in developing phonemic awareness, letter and sound knowledge, and vocabulary. Hence, screening tests in kindergarten bases on phonological awareness, especially various combinations of letter naming fluency, letter sound identification, phoneme segmentation, and sound repetition (Foorman et al., 1998; O'Connor & Jenkins, 1999) including of nonsense words. In 1st and 2nd grades, students grow in phonemic spelling, decoding, word identification, and text reading. Logically, screening tests in 1st grade use various combinations of word identification fluency, letter naming fluency, letter sound identification, phoneme segmentation, sound repetition, vocabulary, and word identification fluency (Compton, Fuchs, & Fuchs, 2007; Foorman et al., 1998; O'Connor & Jenkins, 1999). As students move to higher grades, they gain ability to comprehend increasingly difficult texts. Thus, screening measures valid for beginning 1st graders (word identification fluency) differ from those valid for kindergarten (letter naming fluency) or 2nd grade students (oral reading skill). So, in grade 1, 2 and 3, letter knowledge, word identification fluency and oral reading fluency are useful screening tasks. Conspicuously few studies on screening go beyond Grade 2. Whatever tests available for grades 4 to 6 use oral reading fluency and reading comprehension (Slavin & Madden, 2006) though older students who struggle with reading can have decoding problems, too (Johnson & Pool, 2009).

Specifically in Malayalam, higher difficulty occur in the areas viz., concluding, comprehending and reproducing read passages, oral word and letter sound recognition, comprehending heard passage and word identification. Nearly half the pupils in upper primary school have difficulty in interpolating or extrapolating a simple passage in Malayalam (Gafoor & Kaleeludeen, 2008). Elementary reading comprehension in Malayalam is not up to the level expected of Grade 3 students among around half the students in Grade 5, though it slightly improves in the next two grades. Nearly half the pupils in grades 5 to 7 have difficulty in interpolating or extrapolating a simple passage in Malayalam. Only 58.2 percent of students in Grades 5-7 could meet the criteria in reading, with students scoring only 50.88 percent on vocabulary of Grade 3 level and 67.62 percent on knowledge of alphabet expected at Grade 2 (Gafoor, 2011). Tasks on identification of incorrect spelling in Malayalam are especially useful as dyslexics are good in recognizing correct spelling, but not so with pseudo words (Gafoor & Remia, 2013a). Reading comprehension is significantly and positively related to morphological awareness, and phonological awareness in Malayalam (Gafoor & Remia, 2013b).

Defining Features of Screening Tests for Students' Language Difficulties

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Screening involves brief, valid, reliable and evidence-based assessments conducted to identify students who are at-risk of academic failure and need additional or alternative forms of instruction to supplement the conventional general education approach. Screening measures are developed to serve as very brief assessments of a particular skill or ability that is highly predictive and accurate of a later outcome to help quickly sort students into those who require intervention and those who do not. Screening measures are not very comprehensive, and focus on a specific skill that is highly correlated with a broader measure of reading achievement (Johnson & Pool, 2009). They need be quick to administer, low-cost, repeatable testing of age-appropriate skills of all students.

Screening tests for language difficulties are developed on elements of language use namely morphology, phonology, prosody, semantics and syntax. Phonology applies to set of rules for sound production. Morphology covers the rules governing meanings of word units. Prosody is appropriate intonation, rate, rhythm, and loudness of speech utterances. Semantics is measured as set of words known to a person that are a part of a specific language (vocabulary). Syntax is the way linguistic elements are put together to form phrases or clauses (grammar) (Jenkins, & Johnson, 2011).

Screening approaches has to satisfy three criteria (Jenkins, 2003). First is classification accuracy—a good screen accurately classifies students as at risk or not at risk for reading failure. Second is efficiency—the procedure must not be too costly, time-consuming, and cumbersome to implement. Good screens can be administered, scored, and interpreted quickly and accurately. Third is consequential validity—overall, the net effect for students must be positive in obtaining timely and effective intervention subsequent to the identification of difficulties.

Methods

This section describes 1. The selection of participants for validation of the battery of screening tests, 2. Procedure followed in planning and development of the battery, and 3. Statistical analysis and the results there of to test the sensitivity and specificity of the battery of tests that significantly help in screening boys with RD.

Participants

The sample consisted of 425 boys in upper primary grades 5-7 at the start of the academic year. The study restricts to boys sample only as teachers identified more boys as learning backward than girls and possibly, there can be gender wise difference in nature and extent of RD and in tests that identify RD. The total sample was categorised as Reading Difficult (RD) and Normal Readers (NR) based on their performance on four observations viz., do teachers nominate the student as RD, do the student perform <25 percentile on a language test including reading (inclusion criteria) and writing tasks, and do the student perform <25th percentile on arithmetic tasks (exclusion criteria). A student was identified as RD if all the four criteria were met. There are 98 RDs and 327 NRs in the present sample. The grade-wise distribution of RD and NR boys sampled for the study is in Table 1.

Table 1

Grade-wise distribution of RD and NR boys sampled for the study

Reading status	Grade 5	Grade 6	Grade 7
Difficult (RD)	47	26	25
Normal (NR)	100	99	128

Procedure of Development of Battery of Screen Tests

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While constructing the screening tests, characteristics of screening tests mentioned in previous section along with other suggestions obtained from review were followed. For example, to the extent possible the tests and individual items included in the battery of tests allowed multiple ways for students to demonstrate reading skills, were parallel with the elementary curriculum, are in tune with extant beliefs about how students learn, and appropriate for providing useful data for all stakeholders in helping students in furthering ability to read, and are assessing critical skills related to reading. Yet the test battery is brief enough to assess all students, and easy to score.

The procedure followed in the development of the test battery is to ensure the qualities of a screening test advocated by Jenkins (2003). The major steps in the procedure were as follows.

1. *Defining the future outcome that the screening test seeks to predict [RD and NR]:* Reading difficulty (RD) and normal readers (NR) were identified based on their performance on four observations viz., do teachers nominate the student as RD, do the student perform <25 percentile on a language test including reading (inclusion criteria) and writing tasks, and do the student perform <25th percentile on arithmetic tasks (exclusion criteria). Instead of the suggestion that classification accuracy is predictive in function (Jenkins, 2003), a criterion of being identified as poor on reading (<25th percentile), and teacher identification as student with difficulty in language was applied as inclusion criteria for RD, but from this students who were identified as poor writers only (<25th percentile) and students who were poor on arithmetic (<25th percentile) were excluded. Existing reading, writing, and arithmetic tests were used for this purpose. A student was identified as RD if all the four criteria were met.

2. *Identification of early predictors of later reading outcomes sensitive to different levels of reading development*: The selection of screening tests and items were done by (i) choosing early predictors of reading outcomes from previous research in other languages and (ii) choosing tasks that could identify RD in Malayalam on the basis of previous research. Eight tests viz., letter sound recognition, letter pronunciation (reading), initial sound fluency, word recognition (auditory), phoneme segmentation, word fluency, oral reading, and hearing comprehension were arrived at from initial pool of 15 tests including tests on advanced vocabulary, nonsense word fluency, word comprehension, interpolating (read passage), extrapolating (read passage), reproducing passage (retell), and combining words (morphology). Later seven tests were excluded owing to the match with those in the included tests (for example, hearing comprehension vs. interpolation and extrapolation) or owing to their inability to discriminate among RD and NR categories consequent to mean difference analysis.

3. *Development of tasks for the screening tests*: This was based on item formats and tasks used in screening tests especially in English like Comprehensive Test of Phonological Processing, (2nd edition, 1999), Diagnostic Reading Analysis (2008, 2nd edition), Hodder Group Reading Test 3, (2007), Woodcock Mastery Reading Test (3rd edition, 2011), and Woodcock-Johnson III Tests of Achievement, and based on suggestion from review on the relevant test forms. In screening and diagnostic situations, phonological awareness is usually measured in terms of phonemic awareness, initial sound and phonemic segmentation. Word identification fluency are related to rules for sound production like alphabetic principle, letter knowledge, vowel sounds, digraphs, blends, prefixes, suffixes, and base words. Reading fluency is shown to be highly correlated with reading performance in the older grades; though the role it plays is unclear (Samuels, 2007) and is measured with nonsense word, word use, oral reading, and passage reading. Vocabulary measures in screening tests use context clues, word parts, and content area vocabulary. Reading comprehension measures make use of sequencing, retelling, predicting, making inferences, drawing conclusions and summarizing tests.

4. *Pilot administration of the test battery:* The Draft Test Battery was administered to 370 children representative of the study population and the item discrimination power were verified using

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conventional procedure of significant difference between high-low groups based on which 7 of the 15 tests were discarded.

5. *Deciding the cut score on the tests:* The data from pilot administration was used to decide the cut score of each test on which it optimally discriminates between RD and NR categories. Cut scores that divide students as potential RD from NR on each of the 8 tests in the battery were identified by checking the frequency distribution of the scores on each test. Cut score is that score on which the difference in proportion of students passing in RD and NR is maximal. Screening cut-points will vary by local conditions of states, districts, and schools, and that the exact approach and choices of screening measures, and cut-points for each test varies with local preferences for criterion measures, the criterion performance level, tolerance for under- and over identification rates. The cut score on the test included in the final screening test battery is in Table 2.

6. *Assembling the test battery:* While finalising the test battery, observations (Jenkins & Johnson, 2011) that multiple measures are more accurate than a single measure, screening measures should address both print and comprehension skill, screening tests may require series of administration, were considered. Hence, the battery was finalised with the least number of tests to accurately classify the students as RD and NR. The scoring is done in terms of cut score, having to examine only whether the examinee scores the cut score or not on the eight tests in the battery.

7. *Validation of the battery*: The classification accuracy indicating the extent to which a screening tool is able to accurately classify students into RD and NR was done using logistic binary multiple regression analysis. Two indices, sensitivity and specificity, are used to gauge a screen's accuracy in classifying students. Sensitivity is the true positive identification; the ability of the screen battery to identify RD. Specificity is the true negative rate, the screen's ability to identify individuals as NR. Specificity is calculated by dividing the number of true negatives by the total number of individuals who perform successfully on the outcome measure. Sensitivity increases as the screen correctly identifies more and more of the students who have later RD, whereas specificity increases as the screen correctly identifies more and more of the students who read satisfactorily. Sensitivity is easily manipulated by adjusting cut-scores (Johnson, Jenkins, Petscher, & Catts, 2009; Jenkins & Johnson, 2011).

Screening Tests Significant in Identifying Reading Difficulty in Malayalam

Eight tests were used as predictors in binary logistic multiple regression to predict membership of in RD or NR categories with forward method to arrive at the most parsimonious model. Logistic regression calculates the probability of NR over the probability of RD. Eight screening tests, the number of items in each, the cut point in each and the percentage of boys identified by the cut score are summarised in table 2.

Table 2

Description of Data Set for Logistic Regression in terms of boys and girls by grade showing Screening Tests for RD, Number Of Items In Each, Cut Point and % Of Boys below the Cut Score in the pilot sample

Tests (brief description of the task)	No. Of items	Cut point	Sensitivity (%)	Status	Grade 5	Grade 6	Grade 7
Letter Pronunciation (Reading)	9	<=7	55	NR	100	97	133
				RD	47	28	20
Letter Sound Recognition (Differentiating "*pa*" Sounds)	4	<=2	55.3	NR	109	93	136
				RD	38	32	17
Initial Sound Fluency (Identifying "*ka*" Sounds With Letters)	4	<=1	46.5	NR	114	105	137
				RD	33	20	16
Word Recognition (Heard Words)	5	<=2	49.2	NR	100	99	128
				RD	47	26	25
Phoneme Segmentation ("da"" *group*)	5	<=4	58.2	NR	106	93	125
				RD	41	32	28
Word Fluency (Recognising Similarly Pronounced Words)	6	<=3	71.9	NR	104	92	121
				RD	43	33	32
Oral Reading	4	<=3	65.3	NR	88	89	118
				RD	59	36	35
Hearing Comprehension	1	=0	73.6	NR	76	90	106
				RD	71	35	47

*RD=1, NR=0

Table 2 shows the tests used for screening the RD boys, the number of items in each test, the cut score on which the boy with RD was tentatively identified, the percentage of boys in the total sample who were provisionally identified as RD or not based on the cut score, the number of boys who were identified as RD or NR using the given cut score by grade and gender.   Three separate binary logistic regression analyses were conducted to predict RD among 5th, 6th, and 7th graders using 8 screening tests as predictors. Results are as follows.

Table 3

Logistic Regression Analysis of screening tasks for identifying RD on 147 grade 5 boys

Predictor	B	S.E.	Wald	df	Sig.	Exp(B)
Letter Sound Recognition	1.69	0.83	4.18	1	0.04	5.41
Initial Sound Fluency	3.39	0.92	13.70	1	0.00	29.56
Phoneme Segmentation	3.33	0.89	13.90	1	0.00	27.97
Word Fluency	2.13	0.87	6.06	1	0.01	8.44
Constant	-8.77	1.92	20.81	1	0.00	0.00
Hearing Comprehension	2.26	0.83	7.41	1	0.01	9.54
Letter Pronunciation	2.17	0.78	7.73	1	0.01	8.80

Cox & Snell R Square=.59
Nagelkerke R Square=.82
Model Chi square (6)= 130.14, p<.01

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A test of the model with 6 predictors from among the 8 tests for identifying RD among grade 5 boys (Table 3) against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between RD and NR (Chi square (6) = 130.14, p<.01). The other two predictor tasks were dropped from the model as their effects are not significant by the Wald statistic. Nagelkerke's R^2 of .82 indicated a strong relationship between prediction and reading status. Prediction success overall was 91.2%, [80.9% for RD (sensitivity) and 96% for NR (specificity)]. Wald statistic to test the significance of individual tests demonstrated that the six tests make significant contribution to prediction (p<.01). The Exp(B) presents the extent to which raising the corresponding measure by one unit influences the odds ratio which is a measure of effect size. If the value exceeds 1 then the odds of an outcome occurring increase; if the figure is less than 1, any increase in the predictor leads to a drop in the odds of the outcome occurring. EXP(B) value in Table 3 indicates that when Letter Sound Recognition is raised by one unit the odds ratio is 11 times as large and therefore boy is 11 more times likely to become RD. The ratio of odds ratios of the independents is the ratio of relative importance of the independent variables in terms of effect on the dependent variable's odds. Initial Sound Fluency and Phoneme Segmentation are the most important variables in terms of effect on deciding RD in Malayalam among grade 5 boys.

Table 4

Logistic Regression Analysis of screening tasks for identifying RD on 125 grade 6 boys

Predictor	B	S.E.	Wald	df	Sig.	Exp(B)
Phoneme Segmentation	3.90	1.64	5.69	1	0.02	49.51
Word Fluency	5.70	1.82	9.85	1	0.00	300.05
Constant	-8.52	2.71	9.86	1	0.00	.00
Hearing Comprehension	7.26	2.33	9.70	1	0.00	1.42
Oral Reading	3.13	1.37	5.20	1	0.02	22.84

Cox & Snell R Square=.57
Nagelkerke R Square=.89
Model Chi square (4)= 105.18, p<.01

A test of the model with 4 predictors from among the 8 tests for identifying RD among grade 6 boys (Table 4) against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between RD and NR (Chi square (4)= 105.180, p<.01). The other predictors were dropped from the model as their effects are not significant by the Wald statistic. Nagelkerke's R^2 of .89 indicated a strong relationship between prediction and reading status. Prediction success overall was 96.0% [88.5% for RD (sensitivity) and 98% for NR (specificity)]. Wald statistic to test the significance of individual tests demonstrated that the four tests make significant contribution to prediction (p< .01). EXP(B) value indicates that when Word Fluency is raised by one unit the odds ratio is 300 times as large and therefore the boy is 300 more times likely to become RD. Word Fluency and Phoneme Segmentation are the most important variables in terms of effect on deciding RD in Malayalam among grade 6 boys.

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Table 5

Logistic Regression Analysis of screening tasks for identifying RD on 153 grade 7 boys

Predictor	B	S.E.	Wald	df	Sig.	Exp(B)
Letter Sound Recognition	4.20	1.51	7.78	1	0.01	66.71
Initial Sound Fluency	2.93	1.48	3.93	1	0.05	18.64
Auditory Word recognition	3.50	1.21	8.36	1	0.00	33.26
Word fluency	3.87	1.26	9.43	1	0.00	47.79
Hearing comprehension	3.00	1.23	6.00	1	0.01	20.12
Mechanics of reading	1.71	1.01	2.85	1	0.09	5.50
Letter pronunciation	2.90	1.37	4.46	1	0.04	18.20
Constant	-13.15	3.41	14.85	1	0.00	0.00

Cox & Snell R Square =.49
Nagelkerke R Square=.83
Model Chi square (7)= 103.06, p< .01

A test of the model with 7 predictors from among the 8 tests for identifying RD among grade 7 boys (Table 5) against a constant only model was statistically significant, indicating that the predictors as a set reliably distinguished between RD and NR (Chi square (7)= 103.059, p<.01). One predictor was dropped from the model as its effect is not significant by the Wald statistic. Nagelkerke's R^2 of .831 indicated a strong relationship between prediction and reading status. Prediction success overall was 98.0% [92% for RD (sensitivity) and 99.2% for NR (specificity)]. Wald statistic to test the significance of individual tests demonstrated that the seven tests make significant contribution to prediction (p< .01). EXP(B) value indicates that when letter sound recognition is raised by one unit the odds ratio is 66 times as large and therefore boy is 66 more times likely to become RD. Letter sound recognition and Word fluency are the most important variables in terms of effect on deciding RD in Malayalam among grade 7 boys.

Conclusion and Suggestions

Eight screening tests used in the study viz., Letter Pronunciation (Reading), Letter Sound Recognition, Initial Sound Fluency, Word Recognition (Recognising Heard Words), Phoneme Segmentation, Word Fluency, Oral Reading, and Hearing Comprehension if used with their respective cut score can reliably demarcate upper primary boys with and without RD in Malayalam. The extent of influence of each test on the reading status of boys along with the sensitivity and specificity of the battery of screening tests for boys from grade 5 to7 are given in Table 6.

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Table 6

Summary of Exp(B) of the eight screen tests and the sensitivity and specificity of the significant models for identifying RD among grade 5, 6 and 7 boys

Tests	Grade 5	Grade 6	Grade 7
Letter Pronunciation (Reading)	-	-	18.20
Letter Sound Recognition-	5.41	-	66.71
Initial Sound Fluency	29.56	-	18.64
Word Recognition (Recognising Heard Words)	-	-	33.26
Phoneme Segmentation	27.97	49.51	-
Word Fluency	8.44	300	47.79
Oral Reading	-	22.84	5.50
Hearing Comprehension	9.54	.0142	20.12
Sensitivity (% of Boys rightly Identified as RD)	80.9	88.5	92.0
Specificity (% of Boys rightly Identified as NR)	96.0	98.0	99.2
Overall (% of Boys rightly screened as RD or NR)	91.2	96.0	98.0

Overall effectiveness of the screening tests to identify RD in Malayalam among upper primary boys is high, with 91 to 98% of them being rightly screened using 4 to 7 tests in the battery of screening tests. Teachers and counsellors can use the battery as a whole or the individual tests for quick identification of risk for RD in Malayalam. Though the test is validated for upper primary grades, the increasing trend observed in the overall efficacy of test from grades 5 to 7 implies that the test battery can be useful for teachers in high school as well for identification of boys in need of attention for special reading instruction. At secondary level general screening information from the previous year's summative assessment can be used to identify students who did not meet or who only just met grade-level performance benchmarks (Torgesen & Miller, 2009) prior to applying the screening.

The relative importance of individual tests in the screening test battery denoted by odds ratio reveals that Word Fluency, Phoneme Segmentation and Initial Sound Fluency are important in identification of RD in Malayalam. Performance of students on these abilities can be observed even in lower primary schools for enabling early intervention for reading instruction. Importance of hearing Comprehension in identifying reading status in Malayalam increases for the sample as they move up from grade 5 to 7. The cut score indicated in the study is modifiable by the school or district in accord with the specific criterion test it will use later to measure reading ability (Jenkins & Johnson, 2011). This initial pool of identified students then requires additional assessment to determine the extent and nature of their reading problems.

This study corroborates the perception that the problems that older struggling readers face are primarily due to a lack of vocabulary and comprehension skills (Catts, Hogan, & Adlof, 2005). This deduction is warranted as Word Fluency, Phoneme Segmentation and Initial Sound Fluency which are different aspects of vocabulary are found important in identification of reading difficulty in Malayalam as well. Importance of hearing comprehension in identifying reading status in Malayalam is observed by this study also.

Screenings to all students can be applied more than once a year. Putting the mastery learning principle as the criterion, at least 80% of all students in the school should be showing adequate progress in these elementary tasks incorporated in the screening tests. If more than 20% of the students fail to catch up to the cut score in each significant area, the school must focus on improving the core instruction in the related content. Screening helps in identifying students who fail to make expected progress and those who require additional diagnostic assessment to understand the causes that help in planning, modifying and differentiating reading instruction. Analysis of student reading, classroom observations, and diagnostic

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interviewing of student/family too are important to determine the accuracy of screening. Those who fail to pass the screen test even in the upper primary classes may be provided with research supported interventions to develop literacy. Explicit instruction of reading writing strategies, focus on using reading to support motivation and engagement, focus on formative and summative assessment of students (Biancarosa & Snow, 2006), and a comprehensive and coordinated literacy program (Biancarosa & Snow, 2006) are useful in this respect.

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