The Educational Review, USA, 2023, 7(8), 1037-1051
https://www.hillpublisher.com/journals/er/
ISSN Online: 2575-7946
ISSN Print: 2575-7938

Relations between Decoding, Fluency, and Comprehension for L2 English Readers in India

Sunaina Shenoy*, Kathryn Overton

University of New Mexico, Albuquerque, New Mexico, USA.

How to cite this paper: Sunaina Shenoy, Kathryn Overton. (2023). Relations between Decoding, Fluency, and Comprehension for L2 English Readers in India. *The Educational Review, USA*, 7(8), 1037-1051.
DOI: 10.26855/er.2023.08.001

Received: July 28, 2023
Accepted: August 25, 2023
Published: September 18, 2023

Corresponding author: Sunaina Shenoy, University of New Mexico, Albuquerque, New Mexico, USA.

Abstract

We report on a study that was conducted in an urban city center, Bangalore, India. The participants included 1,052 students from Grades 1, 3 and 5, who came from different home language backgrounds and attended schools where the language of instruction was English. The students' L2 English reading skills were measured using DIBELS and Easy CBM. The purpose of this study was to examine relations between basic skills, fluency, and comprehension. Using confirmatory factor analysis (CFA), for students in Grade 1, we found reading skills mapped on to three latent factors: "letter sounds", "letter names" and "fluency and comprehension". For students in Grade 3, we found reading skills mapped on to two latent factors: "word and passage level fluency and comprehension" and "sentence and retell level fluency and comprehension". For students in Grade 5, we found reading skills mapped on to two latent factors: "fluency" and "comprehension". Implications for reading assessment and instruction practices within the Indian context will be discussed.

Keywords

Confirmatory factor analysis, curriculum-based measures, reading, L2 English

1. Relations between Decoding, Fluency, and Comprehension for L2 English Readers in India

Eighty percent of Indian schools are government schools, but because of the poor quality of education, 27% of Indian children are privately educated (Annual Status of Education Report, 2016, p. 122). In urban centers, more than 50% of children (27 million) attend private schools (Annual Status of Education Report, 2016, p. 122). These private schools follow a state, national or international standardized curriculum, and the language of instruction is English (Kurrien, 2005). Government schools on the other hand follow a state-level curriculum and the language of instruction is the State language. There is a push towards English medium instruction in the private schools to promote social and economic mobility for students attending these schools. According to Kalyanpur (2020), this is creating a new group of marginalized students in India; a group that attends low-cost private schools and for whom English still seems inaccessible because of the poor quality of instruction in these schools.

In schools where English is the language of instruction, a larger number of students are proficient in all domains of speaking, listening, reading and writing in English, and consider it to be their dominant language. Our study was conducted in low-cost, middle-cost and high-cost private schools located in an urban city center, Bangalore that is located in the Southern state of Karnataka. We focused on measuring students' L2 English reading skills because for our sample of students in Bangalore, it was the language of instruction and represented their access to literacy.

1.1 Alphabet-Spelling Method vs. Phonics-Based Reading Instruction

The predominant method used to teach reading in India is the "Alphabet-Spelling Method" (Gupta, 2014, p. 3911). Students are taught letter names and how to spell out words, bypassing the sound structure of the language; and they acquire new words by sight word recognition instead. Students are expected to learn to recognize new, unfamiliar words by rote-memorization (Annamalai, 2004). It is very common for teachers in Indian classrooms to teach reading by focusing on written products, such as copying from the board and choral recitation, rather than comprehension. One teacher in Gupta's (2014) study reported: "These children are not reading because they are not copying the letters." In class, teachers used terms that are central to initial reading—picture, word, letter, sound and spelling—interchangeably" (Gupta, 2014, p. 3912).

The most popular method for implementing reading instruction in English-speaking countries is systematic phonics. It stresses the acquisition of letter-sound correspondences to learn new, unfamiliar words. There is a lot of support for systematic, synthetic phonics programs for native speakers of English (Ehri et al., 2001; Johnston & Watson, 2005). It is also seen to benefit students who speak English as a second language (Stuart, 1999; Stuart, 2004). This latter finding is especially relevant to an Indian context where students come from bilingual or multilingual home backgrounds.

Dixon et al. (2011) attempted to introduce Phonics-Based Instruction in English-medium low-income private schools in Hyderabad, India. They had a control group that received traditional English instruction involving rote learning and whole word recognition and an experimental group that received phonics-based instruction. Their findings showed a statistically significant difference between the experimental and control groups, with the experimental group performing better on measures of reading, spelling and sounding out letters and words (Dixon et al., 2011). Similar findings were reported for students attending rural schools in India (Gupta, 2014). Nishanimut et al. (2013) introduced a phonics approach in L2 English, where letter sounds were represented by the symbols used in the child's L1 Kannada, and found that tapping into their L1 reading instruction helped them learn English better than phonics-based instruction programs in English alone.

1.2 Progress-Monitoring Measures

Students in India are typically assessed only on their written content area skills, with the assumption that these assessments indirectly measure students' reading abilities. The predominant format for testing is targeted at students producing short answers and essays, and it taps into their rote-memorization skills (Ramanathan, 2008). Questions are limited to those that have been extensively covered in class and for which teachers have given students appropriate responses. Moreover, domains such as speaking, listening and reading are not always tested in the elementary grades. Given the context, we were interested in assessing reading skills and possibly introducing reading assessments and progress-monitoring tools that could not only keep track of student progress but also help guide instruction for teachers.

These progress-monitoring tools were adapted for our current study, in order to measure reading trajectories in L2 English in our sample of students in India. Because teachers in Bangalore, India did not follow a phonics-based curriculum, but rather followed the alphabet-spelling method, we expected to see overall low scores on measures of decoding skills such as letter sounds, nonsense word fluency and phoneme segmenting, but we were still interested in learning how they performed on these critical reading subtests. Additionally, we wanted to explore how they would perform on fluency and comprehension measures and whether the reading instruction they were currently receiving—namely the Alphabet-Spelling Method (Gupta, 2014)—would impact their scores. Our rationale for utilizing both the DIBELS Next and easy CBM measures was to be able to capture a wide variety of subtests that measured reading in elementary grades, as well as to observe their efficacy and reliability as assessments of L2 English reading development within the Indian context.

For consistency, we maintained the content and administration procedures, employed in the US. For the comprehension measures, we selected culture-free passages which discussed generic themes such as taking care of a pet dog, trees and plants and going to the market. For example, a passage titled "Parts of a Tree" was chosen instead of "The Cocoa Stand" as the latter was not relevant to the Indian context. The passages were modified to reflect names that are common within the Indian context (e.g. "Abby" was replaced with "Asha") and some words were changed to reflect common usage in the culture (e.g. "jump rope" was replaced with "skipping rope"), but the essence of the passages in terms of meaning and comprehension were not changed.

1.3 Current Study and Research Questions

We recruited students from six private school sites, two low-cost schools that followed a State board curriculum, two

middle-cost schools followed a National Board Curriculum that is prescribed by the Central Board of Education in India; one high-cost school followed the National Board Curriculum and the other followed a Montessori Curriculum. For our sample of students, English was the language of instruction across all school sites. Hindi was introduced in Grade 2 for students following the National board and Montessori curricula in the middle-high cost schools, and in grade 4 for students following the State board curriculum in low-cost schools. Kannada was introduced in Grade 5 for students following the National board and Montessori curricula in the middle-high cost schools, and in grade 2 for students following the State board curriculum in low-cost schools. Five out of six school sites in our sample predominantly used the alphabet-spelling method to teach reading with the exception of the Montessori school which used phonics-based instruction models. Finally, all the school sites, with the exception of the Montessori school, only measured students writing skills and did not measure skills in other domains like speaking, listening and reading.

We were interested in the latent structure of L2 English reading development for students in the Indian context. As far as we know, this has not been explored in the literature, and we hypothesized that the absence of phonics instruction in this context would dramatically affect reading skills acquisition, and in turn the latent factor loadings in our models. We believe the following research questions are an important contribution to the reading literature:

1) What is the latent structure of L2 English early literacy skills for students in Grades 1?
2) What is the latent structure of L2 English fluency and comprehension skills for students in Grades 3 and 5?

2. Method

2.1 Participants

The sample consisted of 1,052 students from Grades 1, 3 and 5. We chose these grades because they represented a developmental continuum of reading skills acquisition moving from decoding to fluency to comprehension. Students came from different home language backgrounds and were enrolled in English-medium schools. They did not receive any additional bilingual support for the development of their home languages and were not expected to be bi-literate in both languages. The demographic information of the students and school characteristics are presented in Table 1. There were 12 home languages represented in our sample of students. The home language (L1) information of the students is presented in Table 2 and these data were retrieved from class teachers.

Table 1. Demographic Data for the Students in the Sample

			Grade 1 (N=346)		Grade 3 (N=328)		Grade 5 (N=329)	
			Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Individual Characteristics	Gender	Male	171	49.42	179	54.57	189	57.45
		Female	175	50.58	149	45.43	140	42.55
	SES	Low-Income	46	13.29	40	12.20	45	13.68
		Middle-Income	175	50.58	220	67.07	210	63.83
		High-Income	125	36.13	68	20.73	74	22.49
School Characteristics	School Type	Low-Cost 1	37	10.69	36	10.98	37	11.25
		Low-Cost 2	9	2.60	4	1.22	8	2.43
		Middle-Cost 1	74	21.39	84	25.61	83	25. 23
		Middle Cost 2	101	29.19	136	41.46	127	38.60
		High Cost 1	107	30.92	51	15.55	71	21.58
		High Cost 2	18	5.20	17	5.18	3	0.91
	Curriculum	State	46	13.29	40	12.20	45	13.68
		National	282	81.50	271	82.62	281	85.41
		Montessori	18	5.20	17	5.18	3	0.91

Table 2. Home Language (L1) Data for Students in the Sample

Names of Languages	Grade 1 (N=346)		Grade 3 (N=328)		Grade 5 (N=329)	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Kannada	75	21.68	102	31.09	84	25.53
Hindi	55	15.89	62	18.90	70	21.27
Telugu	48	13.87	45	13.72	67	20.36
Bengali	36	10.40	26	7.91	0	0
Tamil	32	9.25	22	6.71	45	13.67
Urdu	29	8.38	35	10.67	15	4.56
Malayalam	25	7.23	17	5.18	0	0
Gujarati	25	7.23	0	0	2	0.60
Marathi	21	6.07	0	0	21	6.38
Kodava	0	0	3	0.91	10	3.04
Konkani	0	0	8	2.45	0	0
Tulu	0	0	10	3.05	15	4.55

2.2 School Setting

Our six school sites were located in an urban city center, Bangalore. Two schools were low-cost schools, two were middle-cost and two were high-cost. Students represented low-income, middle-income and high-income backgrounds and attended low-cost, middle-cost and high-cost schools respectively. Table 1 presents the school characteristics. For the purposes of this study, a low-cost school was defined as a private school in Bangalore, India where the annual tuition costs per student was approximately Rupees 7,200 ($120); the middle-cost school was a private school where the annual tuition costs per student was approximately Rupees 40,000 ($667); and the high-cost school was a private school where the annual tuition costs per student was approximately Rupees 150,000 ($2,500). Moreover, low-income household was defined as families whose monthly income was between Rupees 0-20,000 ($0-275), middle-income household was defined as families whose monthly income was between Rupees 21,000-70,000 ($285-956) and high-income household was defined as families whose monthly income exceeded Rupees 71,000 (above $1,000). We collected this data from classroom teachers.

The low-cost schools followed a State board curriculum that is prescribed by the state of Karnataka; the middle-cost schools followed a National board curriculum that is prescribed by the Central Board of Education in India, one high-cost school followed the National board curriculum, and the other followed a Montessori curriculum. The National board curriculum is more rigorous, preparing students to find national and international jobs. The State board curriculum is less rigorous, intending for students to find jobs only within the state of Karnataka. All schools introduced English in kindergarten and provided instruction in English in all content areas throughout the day.

2.3 Measures

2.3.1 DIBELS Next Subtests

All these subtests were timed measures and were administered for 1 minute each. The following subtests were administered for students in Grade 1: (a) Letter Naming Fluency; (b) Phoneme Segmenting Fluency; (c) Nonsense Word Fluency; (d) Oral Reading Fluency; (e) Retell Fluency. The following subtests were administered for students in Grades 3 and 5: (a) Oral Reading Fluency; (b) Retell Fluency; (c) DAZE Comprehension.

2.3.2 Easy CBM Subtests

All subtests were timed tests and were administered for 1 minute each. The following subtests were administered for students in Grade 1: (a) Letter Names; (b) Letter Sounds; (c) Phoneme Segmenting; (d) Word Reading Fluency; (e) Passage Reading Fluency. The following subtests were administered for students in both Grades 3 and 5, except Word

Reading Fluency that was only administered to students in Grade 3: (a) Word Reading Fluency; (b) Passage Reading Fluency; (c) Multiple Choices Reading Comprehension.

Table 3. Summary Statistics for Reading Subtests in Grade 1

		Month Zero; N= 346		Month Three; N= 368		Month Six; N=364	
		Mean (SD)	**Min Max**	**Mean (SD)**	**Min Max**	**Mean (SD)**	**Min Max**
TOSREC		4.89	0	6.89	0	9.67	0
		(7.06)	40	(7.83)	49	(8.31)	41
EasyCBM	LN	48.18	7	58.61	0	63.50	19
		(15.63)	90	(19.50)	100	(18.46)	100
	LS	20.64	0	30.09	0	31.09	0
		(14.56)	63	(17.77)	99	(18.21)	90
	PS	14.72	0	22.71	0	23.62	0
		(12.01)	51	(16.12)	73	(16.88)	68
	WRF	14.31	0	23.50	0	30.83	0
		(15.53)	118	(21.13)	120	(24.26)	109
	PRF	12.72	0	23.83	0	34.27	0
		(23.35)	185	(26.87)	162	(33.73)	254
DIBELS	LNF	47.00	3	56.48	0	61.88	1
		(17.79)	96	(20.60)	110	(19.32)	110
	PSF	18.11	0	24.42	0	27.80	0
		(16.13)	80	(18.42)	80	(19.08)	80
	NWF-CLS	15.46	0	28.17	0	26.83	0
		(16.64)	143	(25.21)	141	(22.18)	100
	NWF-WWR	7.28	0	10.17	0	11.88	0
		(9.24)	50	(10.83)	50	(11.54)	50
	ORF	13.52	0	25.70	0	32.70	0
		(20.49)	192	(31.51)	207	(33.93)	250
	RTF	1.89	0	3.10	0	3.59	0
		(4.47)	36	(6.20)	48	(5.64)	35

Key: Test of Silent Reading Efficiency and Comprehension (TOSREC); Letter Names (LN); Letter Sounds (LS); Phoneme Segmentation (PS); Word Reading Fluency (WRF); Passage Reading Fluency (PRF); Letter Naming Fluency (LNF); Phoneme Segmentation Fluency (PSF), Nonsense Word Fluency-Letter Sounds (NWF-CLS); Nonsense Word Fluency-Words Read Correctly (NWF-WRC); Oral Reading Fluency (ORF); Retell Fluency (RTF).

Table 4. Summary Statistics for Reading Subtests for Students in Grade 3

		Month Zero; N = 328		Month Three; N = 347		Month Six; N = 345	
		Mean (SD)	**Min Max**	**Mean (SD)**	**Min Max**	**Mean (SD)**	**Min Max**
TOSREC		12.51	0	15.86	0	13.18	0
		(7.48)	48	(8.91)	52	(8.24)	51
DIBELS	ORF	58.80	0	63.30	0	69.27	0
		(39.54)	249	(40.86)	292	(38.99)	205
	RF	9.84	0	7.94	0	5.94	0
		(14.60)	94	(12.15)	94	(7.50)	55
	DAZE	3.35	0	5.97	0	8.34	0
		(4.53)	36	(5.54)	33	(8.09)	45
Easy CBM	WRF	36.19	0	40.10	0	47.56	0
		(23.64)	115	(24.56)	128	(26.41)	144
	PRF	66.06	0	70.16	0	79.07	0
		(42.10)	207	(41.82)	218	41.23	236
	MCRC	5.70	0	8.06	0	7.45	0
		(3.27)	18	(3.76)	19	(3.09)	17

Table 5. Summary Statistics for Reading Subtests for Students in Grade 5

		Month Zero; N = 329		Month Three; N = 348		Month Six; N = 343	
		Mean (SD)	**Min Max**	**Mean (SD)**	**Min Max**	**Mean (SD)**	**Min Max**
TOSREC		11.52	0	15.87	0	16.76	0
		(7.61)	36	(8.38)	45	(8.07)	56
DIBELS	ORF	83.00	0	105.12	0	92.53	0
		(40.55)	206	(43.59)	215	(40.77)	193
	RF	17.84	0	20.47	0	11.89	0
		(18.14)	90	(17.08)	92	(11.54)	70
	DAZE	9.25	0	9.93	0	13.01	0
		(8.20)	51	(6.88)	34	(8.89)	45
Easy CBM	PRF	104.56	0	114.68	0	120.11	1
		(44.51)	241	(45.67)	250	(45.90)	248
	MCRC	10.64	0	9.30	0	10.02	0
		(3.50)	20	(3.526)	17	(3.45)	19

2.3.3 Test of Silent Reading Efficiency and Comprehension (TOSREC)

Students were expected to read various statements and conclude if they were true or false. For example, they read a statement such as "A lion can fly" and checked a box labeled "yes" or "no". The test was timed for 3 minutes, and raw scores were calculated by subtracting incorrect responses from correct ones. Some words that were written in American English were changed to Indian English so that students would comprehend them in this context (e.g. the word "cookies" was changed to "biscuits"). But the meaning of the text was retained in all instances.

2.4 Procedure and Data Collection

The sample was recruited from six school sites across Bangalore, Karnataka. Appointments were sought with the managing committees and/or principals of each of the schools, where they were briefed on the objectives of the study and the methodology that would be adopted. While several schools recognized the need for a study such as this, a deterrent to participation for many was that, as a longitudinal study, data would be collected at three different time periods over the course of the academic year 2017-18. The principals of schools that agreed to participate signed a consent form and informed consent was also sought from the parents of the participants.

A data collection schedule was developed for each of the participating schools based on the convenience of the school and students, aligned as best as possible to the terminal tests/exams conducted during the year. Data was collected using a team of 15 volunteer assessors, who underwent rigorous training on test administration and scoring at the start of the study, and refresher training before each subsequent data collection period. Data collection for each time period ranged roughly between 3 weeks to one month. Efforts were made to ensure very minimal amounts of missing data (from students absent from school on the day(s) data was collected) from each time period, with assessors revisiting schools to assess absentees. The reading measures were administered across three phases during the 2017-18 academic year—spanning June-March in India—so the reading measures were administered July-August, October-November and January-February to correspond with benchmark assessments that are administered in Fall, Winter and Spring in the US. The total individual administration time was approximately 30 minutes per student. Each test was individually administered with care taken to ensure the students were given adequate breaks to prevent fatigue.

2.5 Data Analyses

The primary purpose of this project was to analyze the latent structure of reading skills within the L2 context. For each of the three grade levels, we employed a complete battery of tests including the Dibels NEXT, Easy CBM, and TOSREC. However, several of the subtests within each general assessment capture similar or overlapping skill sets. Thus, we observed the entire body of variables and tried to understand ways that indicators, which appear to be superficially different, actually represent similar underlying competencies, i.e., *latent factors.* Mathematically, the factors are created by finding the unique group of eigenvalues for the dataset; each eigenvalue represents the singular vector of values from which other vectors, in this case, subtests, are generated. In this way, the latent factor analysis reduces the overall dimensionality of the data. For example, instead of a battery of assessments containing twelve subtests, an LFA may reduce the data down to two or three traits, which are held in common across several of the indicators. This process of 'flattening' the data permits us to draw two conclusions. First, we can gauge the number of unique traits, or skills sets, that underlie the data. In addition, we are able to chart the component skills that tend to cluster together.

Within the CFA model, each of the subtests will associate with, or load onto, a latent factor. However, each subtest contains a portion of its overall error and variance that is unique. The ratio between the degrees of variance that is unique to each subtest, versus the level of variance that is shared in common, affects the degree to which the subtests load onto particular factors. Each set of factors are orthogonal – similar to the x, y, and z axes on a three-dimensional plane. Using Mplus software, we have the capacity to create a map of the factor loadings that demonstrate the degree to which particular subtests are close each axis. In many instances, it is the case that a single subtest will straddle two axes. If two associations are created, i.e. there is more than one factor-loading, we employ the higher of the two ratios to represent that skill. In addition, we must specify whether the latent factors are correlated with one another. In this instance, the correlation is intuitive given the fact that each subtest pertains to reading skills.

Our data consisted of student test scores observed at three-time points throughout the first (N= 364), third (N = 345), and fifth (N = 343) grade years. For this project, we employed a simple geometric average of the three periods. Note that our data represented simultaneous cohorts; they are not pooled panel cross-sections. As a result, we compared and contrasted the average distribution of latent factors in each of the three grades. Our goal was to perform a confirmatory factor analysis (CFA). Prior to implementing the model, however, we checked the data for distributional prerequisites. For instance, CFA designs require that data are continuous and multivariate normally distributed. In this case, however,

the majority of our indicators were skewed with significant floor effects (See Figures 1-3 for more details). To correct this problem, we designated our data as left-censored and employed a *robust maximum likelihood* model correction (the MLR function in MPlus software). After testing and correcting for prerequisite modeling assumptions, we performed a latent factors analysis in MPlus. We employed the GEOMIN factor rotation because we assumed that each of the latent factors would be correlated. We employed fit statistics and scree plots (of the eigenvalues) to identify the correct number of latent factors, which we initially varied from 1 to 3. Again, several variables mapped onto more than one factor. In these instances, we chose the statistically significant factor. If neither factor was significant, we chose the factor with the highest loading.

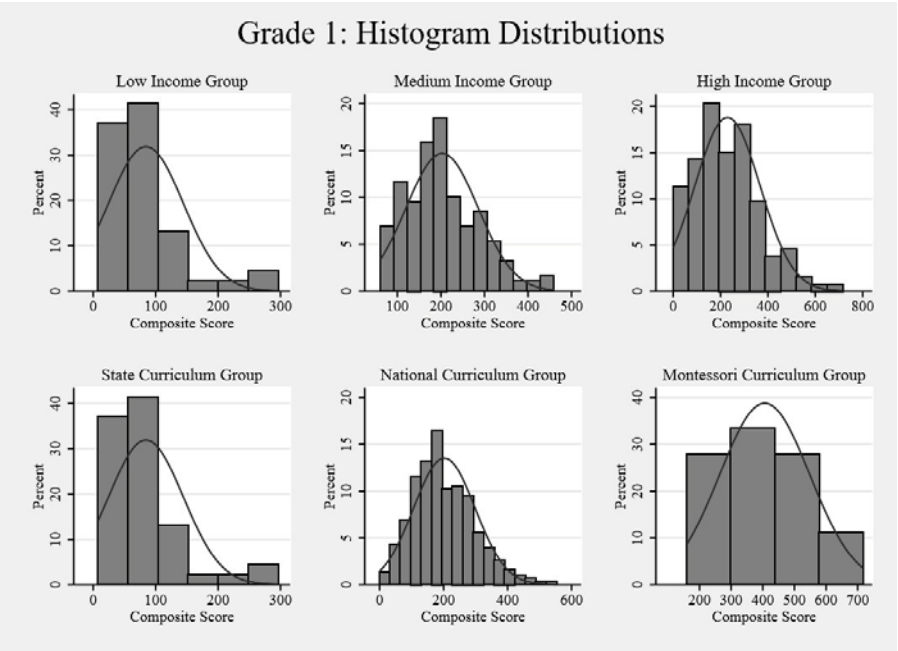

Figure 1. Distribution of Scores across SES and Curriculum Groups for Students in Grade 1.

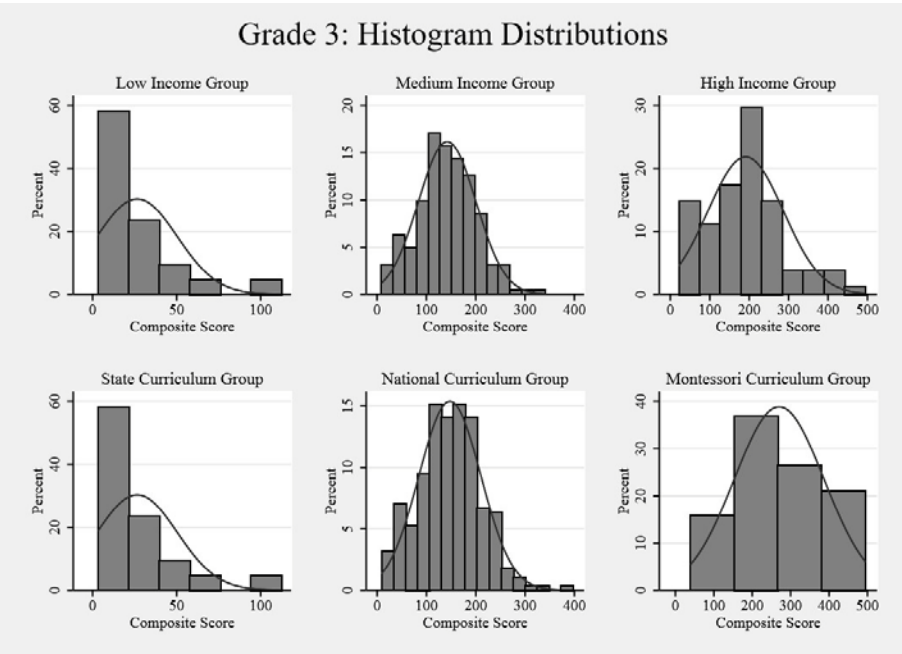

Figure 2. Distribution of Scores across SES and Curriculum Groups for Students in Grade 3.

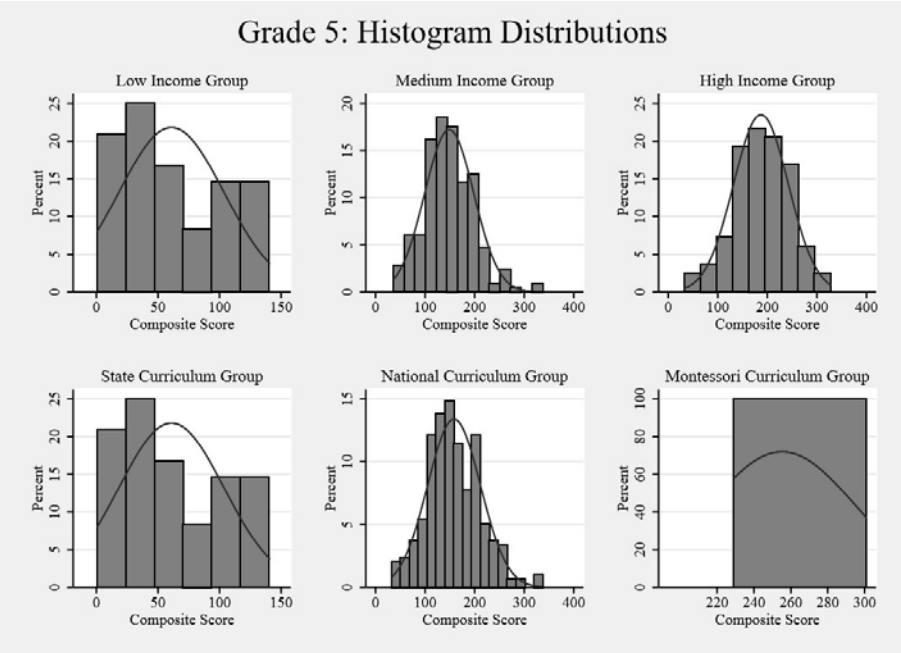

Figure 3. Distribution of Scores across SES and Curriculum Groups for Students in Grade 5.

Table 6. Allocation of Reading Subtests across Models

Grade	Latent Factor Model	Factors	Reading Skills Subtests												
			LNF	LS	NWF CLS		NWF WWR		PSF	WRF	RF	ORF	TOSREC	DAZE	MCRC
One	Model 1: Separate Reading Skills	*1*													
		2								□	□	□	□		
	Model 2: Letter Sounds vs. Letter Names	*1*	□				□								
		2		□	□				□						
		3								□	□	□	□		
	Model 3: Fluency and Comprehension	*1*													
		2								□		□			
		3									□		□		
Three	Model 1: One-Factor	*1*								□	□	□	□		
	Model 2: Separate Reading Skills	*1*								□	□	□			
		2											□	□	□
	Model 3: Passage vs. Sentence	*1*								□		□			□
		2									□		□	□	
Five	Model 1: One-Factor	*1*									□	□	□	□	□
	Model 2: Separate Reading Skills	*1*									□	□			
		2											□	□	□
	Model 3: Passage vs. Sentence	*1*										□			□
		2									□		□	□	□

Table 6 presents the allocation of reading subtests across the models. Some of the DIBELS and East CBM subtests measured the same skills (e.g. letter names and letter naming fluency). In these cases, we chose one subtest to represent that skill in the model. We tested three models in each of the grade levels. Our goal was to test theoretically-informed models that depicted the ways in which students progressed towards reading comprehension. We also wanted to ascertain whether any biological (gender) or environmental (curriculum, income) traits have a measurable impact on the way that students acquire reading skills. As a result, we performed robustness checks using each of the 3 controls and breaking the data into additional subpopulations. For example, for the income measure, we created high, medium, and low-income subpopulations and then re-ran each of the CFA models for each subpopulation. Employing curriculum (3 groups), socioeconomics (3 groups), and gender (2 groups) across 3 theoretical models for each of 3 grades resulted in 24 models x 3 grades = 72 additional models based on each subpopulation.

3. Results

3.1 Fit Statistics and Interpretation of Models

3.1.1 Grade 1

Table 7 presents the comparison of the fit statistics which indicated that the three-factor model was the most appropriate fit for the Grade 1 data. Both the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) are lowest in the three-factor model. Students in Grade 1 did not follow Model 1: "Two Factor Model: Separate Reading Skills" representing a linear progression in skills acquisition beginning with decoding and moving on to fluency and comprehension. The best-fitting model was Model 2: "Early Literacy: Letter Names vs. Letter Sounds". This model separated out early literacy tasks into letter naming tasks and letter sound tasks and found that students in the Indian context acquired these foundational reading skills as two separate skills. Interestingly, the reading skill of nonsense words-words read correctly loaded on to Factor 1: "Letter Names", while the reading skill of nonsense words-correct letter sounds loaded on to Factor 2: "Letter Sounds". Though foundational skills were acquired as two separate skills, we found that this was not the case for higher-order skills like fluency and comprehension, because when these skills were separated out, the resulting Model 3: "Fluency and Comprehension" was not the best-fitting model.

In addition, we performed robustness checks on the first-grade data by running a separate LFA for each of the sub-populations suggested by the variables: gender, socioeconomics, and curriculum. Out of the 22 comparisons that we created, only one variable – Grade 1 Montessori curriculum scores – deviated from the overall pattern in the data. Thus, we were able to state with confidence that our model was robust to changes in gender and income.

Table 7. Model Fit Statistics

Grade Level	Latent Factor Model	Fit Statistics*		
		AIC	BIC	SSA-BIC
One	Separate Reading Skills	22105.20	22214.62	22125.79
	Fluency and Comprehension	22081.63	22198.87	22103.69
	Letter Names vs. Letter Sounds	**21929.98**	**22047.22**	**21952.04**
	One-Factor	12912.40	12981.69	12924.59
Three	Separate Reading Skills	12859.84	12932.97	12872.70
	Passage vs. Sentence	**12846.28**	**12919.41**	**12859.14**
	One-Factor	11344.79	11402.57	11354.99
Five	Passage vs. Sentence	11166.27	11227.91	11177.15
	Separate Reading Skills	**11111.41**	**11173.05**	**11122.29**

*The best fitting models are in boldface print for each grade.

3.1.2 Grade 3

Table 7 presents the comparison of the fit statistics which indicated that the two-factor model was the most appropriate fit for the Grade 3 data. Both the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) are lowest in the two-factor model compared to the one-factor model. Students in Grade 3 did not follow Model 2: "Separate Reading Skills" representing a linear progression in skills acquisition from reading fluency to comprehension. Instead, the best-fitting model was Model 3: "Passage vs. Sentence" representing skills acquisition was based on the task that was measured, with passage-level fluency and comprehension skills and sentence-level fluency and comprehension skills loading on to two separate factors.

In a similar manner, we performed robustness checks on the third-grade data by running a separate LFA for each of the subpopulations suggested by the variables, female, SES, and curriculum. Out of the 22 comparisons that we created, only one variable – Grade 3 high-income scores – deviated from the overall pattern in the data. Thus, we were able to state with confidence that our model was robust to changes in gender and curriculum.

3.1.3 Grade 5

Table 7 presents the comparison of the fit statistics which indicated that the two-factor model was the most appropriate fit for the Grade 5 data. Both the Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) are lowest in the two-factor model compared to the one-factor model. Students in Grade 5 represented Model 2: "Separate Reading Skills", which was a linear progression in skills acquisition from reading fluency to comprehension. Interestingly, the fluency and comprehension task being measured did not matter in Grade 5 as Model 3: "Passage vs. Sentence" was not the best-fitting model.

Like we did in the first and third grade data, we performed robustness checks on the fifth-grade data by running a separate LFA for each of the subpopulations suggested by the confounders: gender, socioeconomics, and curriculum. Out of the 21 comparisons that we created, only one variable – Grade 5 female scores – deviated from the overall pattern in the data. Thus, we were able to state with confidence that our model is robust to changes in gender and curriculum.

Across the three grades, we created 72 models to test for confounders. Out of these models, 7 did not converge due to diminished sample size. Thus—adjusting for non-convergent models—there were 3 deviations from the primary set of 65 models across the three grades. Based on this, we are approximately 95% confident in the robustness of our model results, even which controlling for confounders such as SES, curriculum, and gender. 5% of our data depicts some level of uncertainty for different variables arising across different grades. We save an exploration of the latter finding for future research.

3.2 Subtest Variance

The path diagrams in Figure 4 depicts the subtests that accounted for the most variance in Grade 1 within the three-factor model was nonsense word fluency-words read correctly, letter sounds and word reading fluency respectively. Moreover, the path diagrams in Figure 5 depict the subtests that accounted for the most variance in Grade 3 within the two-factor model was oral reading fluency and TOSREC respectively. Finally, the path diagrams in Figure 6 depict the subtests that accounted for the most variance in Grade 5 within the two-factor model was oral reading fluency and TOSREC.

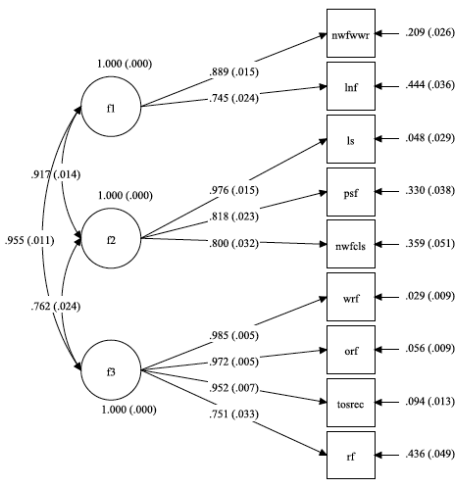

Figure 4. Path Diagram of Grade 1 Subtests.

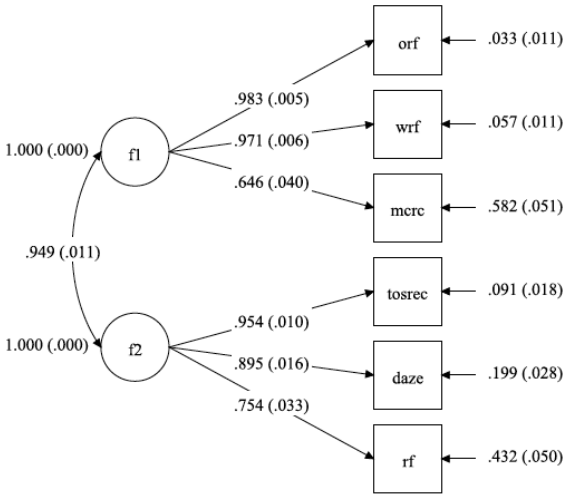

Figure 5. Path Diagram of Grade 3 Subtests.

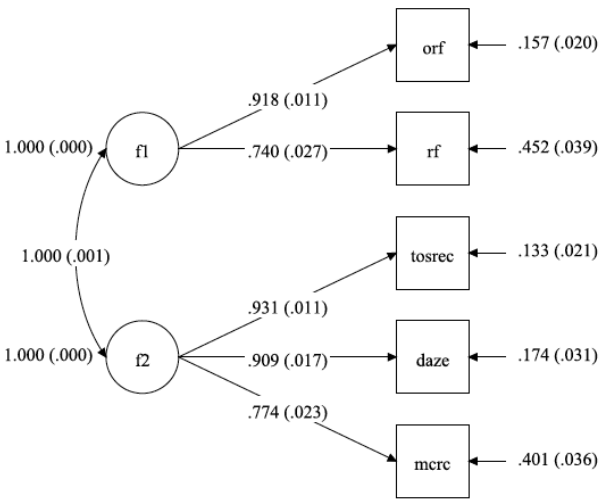

Figure 6. Path Diagram of Grade 5 Subtests.

4. Discussion

The purpose of this study was to use confirmatory factor analysis to observe the latent structure of L2 English reading skills in the Indian context. We were interested in how early literacy skills mapped on to latent structures for students in Grade 1 and how comprehension mapped on to latent structures for students in Grades 3 and 5. We were particularly interested in the role of reading instruction, the Alphabet-Spelling method, and its impact on factor loadings.

For students in Grade 1, we found the best-fitting model was a three-factor model in which one factor represented letter names and nonsense word fluency-words read correctly; the second factor represented letter sounds, phoneme segmenting and nonsense words-correct letter sounds; and the third factor represented fluency and comprehension. One of the main reasons for this could be attributed to the reading skills that are explicitly taught in the Indian context, where the focus is on letter names and not on letter sounds. These early literacy skills were acquired as two different skills, and they seemed to be more influential on reading outcomes for students compared to the fluency and comprehension skills. Moreover, the nonsense word fluency subtest loaded on to letter names in relation to words read correctly and on to letter sounds in relation to correct letter sounds, depicting that students in the Indian context read nonsense words as sight words.

For students in Grade 3, we found the best-fitting model was a two-factor model in which one factor represented word and passage level fluency and comprehension, and the other represented retell and sentence level fluency and

comprehension. The task that was measured seemed to influence reading outcomes. It is important to note that within the Indian context, students are taught letter names, word reading fluency and move on to passage-level fluency skipping retell and sentence-level fluency. This could explain why subtests of word reading fluency, oral reading fluency and MCR Cloaded on to one factor and retell fluency, TOSREC and DAZE loaded on to another factor. Interestingly, in Grade 5, reading skills were not related to reading instruction but rather related to skills acquisition; fluency and comprehension loaded on to two factors that were not related to the tasks that were taught in the Indian context.

Alonzo et al. (2013) examined the internal structure of the easy CBM reading measures for students in Grades K-5. This was the only study we found that looked at the latest structure of reading skills using one of the progress-monitoring measures that we did in our study and that's why we chose to compare the studies. They found a three-factor model of reading in Grades K-2, where letter names, letter sounds and phoneme segmentation loaded on to "early literacy"; word reading fluency and passage reading fluency loaded on to "fluency" and both comprehension measures loaded on to "comprehension". And they found a two-factor model for Grades 3-5 where word reading fluency and passage reading fluency loaded on to "fluency" and both comprehension measures loaded on to "comprehension". Contrasted to this study, we found two early literacy factors for students in Grade 1 and fluency and comprehension tasks influenced reading skills acquisition for students in Grade 3. But by Grade 5, the factor loadings in our study looked very similar to the findings reported by Alonzo et al. (2013) where the authors found a two-factor model for fluency and comprehension in their sample of fifth grade students. Whereas reading instruction seemed to influence reading outcomes for students in Grades 1 and 3, it did not have the same effect on students in Grade 5, where reading skills acquisition seemed to follow a similar trajectory to other L1 readers. The reading instruction affected scores in earlier elementary grades more than it did in later elementary grades.

4.1 Implications for Research

We found that skills taught in the Indian context might influence reading skills acquisition in Grades 1 and 3, but not for Grade 5. This is an important finding in that it adds to our understanding of L2 English reading acquisition in the Indian context and has implications for what assessment and instruction might be appropriate for this context. At the time when this study was conducted, we did not have access to progress-monitoring tools that were developed for the Indian context, so we opted to use DIBELS Next and easy CBM that was normed in the US. But tools designed for the Indian context are now emerging in scholarly literature. For example, Rao et al. (2021) introduced the Dyslexia Assessment for the Languages of India (DALI) assessment tool that has both progress-monitoring tools and a dyslexia screener that is normed on the Indian population. More recently, Misquitta et al. (2022) have developed a literacy-based application called FABLe for the Indian context that complements the DIBELS but introduces reading passages from Indian textbooks. DALI and FABLe show potential of being contextually relevant substitutes for Western-normed CBMs, and the growing pool of research validating them should be followed carefully to consider future use in foundational literacy related studies in the Indian context. Moreover, there is an immense need to introduce empirically-validated reading instruction in India and we propose a move away from the alphabet-spelling method to phonics-based instructional programs in order to improve reading outcomes for students in early grades. Research supports systematic, synthetic phonics programs for native speakers of English (Ehri et al., 2001, Johnston & Watson, 2005) as well as students who speak English as a second language (Stuart, 1999; Stuart, 2004). This latter finding is especially relevant to an Indian context where students come from bilingual or multilingual home backgrounds. Moreover, phonics-based instructional programs have been instrumental in reducing the number of students being identified as being at-risk for reading difficulties. Explicit and systematic phonics instruction can remediate and prevent reading disabilities for both monolingual students (Torgesen, 2000) and English learners (Gersten & Baker, 2003), and this is especially true if students are instructed in these skills in early elementary grades (Ehri et al., 2001).

4.2 Implications for Practice

It also calls for a closer look at reading instruction and its efficacy in improving reading outcomes for students in elementary grades. According to the latest Annual Status of Education Report (ASER), 95.9% of children aged 6-14 years are enrolled in school across India (ASER, 2018). Although school enrollment is high, learning achievement of students is low (Kingdon, 2007). Only 47.8% of children in Grade 5 were able to read Grade 2 level text in any language (ASER, 2018). When tested in English, only 19.3% of students in Grade 3 were able to read simple words like "day" or "sit" (ASER, 2018). Though these statistics were reported for students in rural parts of India, the National Achievement Survey (NAS) reported statistics for students in urban areas and they measured students' scores on language, listening comprehension, word recognition and reading comprehension and found that approximately 50% of

students in Grade 3 were performing below grade level (NCERT, 2014). These alarming statistics in both rural and urban parts of the country call for a revision of reading instruction programs and a need for introducing more rigorous and scientifically-based programs, like phonics-based programs, to improve reading outcomes for L2 English learners in elementary grades. However, this recommendation has to be viewed in light of the exceptional linguistic, cultural, geographic, and socio-economic diversity experienced in India. More studies from different contexts will help generalize findings on student outcomes based on the introduction of evidence-based reading programs to address the school-level literacy performance problem being faced by the country.

4.3 Limitations and Future Directions

Firstly, this study reports on a sample of students from Bangalore, an urban city center in India. It would be helpful to view latent structures of L2 reading in other urban and rural areas in India as a comparison and to be able to generalize our findings. Secondly, as a next step, we plan to report on the mediating role of decoding, fluency and comprehension in each grade level, in addition to the latent structure of the models reported in this paper. We hope this future study will shed light on the influence of foundational skills on higher order skills in the Indian context. Thirdly, there is a need for intervention studies across various sub-populations that will illustrate the efficacy of phonics-based instruction in the Indian context. This will facilitate a stronger argument that a systematic change in reading programs is needed, and this in turn will improve reading outcomes for students.

Data Availability Statement

The data from this study will be shared upon reasonable request.

Human Subjects Approval

This project has received IRB approval. Proposal Number: IRB00000446.

References

Aggarwal, S. (1991). *Three language formula: An educational problem*. Gyan Publishing House.

Alonzo, J., Park, B. J., & Tindal, G. (2013). Examining the Internal Structure of the easyCBM Reading Measures, Grades K-5. Technical Report# 1302. *Behavioral Research and Teaching*.

Anderson, D., Alonzo, J., Tindal, G., Farley, D., Irvin, P. S., Lai, C. F., ... & Wray, K. A. (2014). Technical Manual: easyCBM. Technical Report# 1408. *Behavioral Research and Teaching*.

Annamalai, E. (2004). Medium of power: the question of English education in India, in *Medium of Instruction Policies: Which Agenda*? Whose Agenda? Eds. J.W. Tollefson and A.B.M Tsui (Mahwah, NJ: Lawrence Erlbaum Associates), 177-193.

ASER. (2016). *Annual Status of Education Report* (2016). New Delhi, ASER Centre.

ASER. (2018). *Annual Status of Education Report* (2016). New Delhi, ASER Centre.

Deno, S. L. (2003). Developments in curriculum-based measurement. *The journal of special education*, *37*(3), 184-192.

Dixon, P., Schagen, I., & Seedhouse, P. (2011). The impact of an intervention on children's reading and spelling ability in low-income schools in India. *School Effectiveness and School Improvement*, *22*(4), 461-482.

Ehri, L. C., Nunes, S. R., Stahl, S. A., & Willows, D. M. (2001). Systematic phonics instruction helps students learn to read: evidence from the National Reading Panel's meta-analysis. *Rev. Educ. Res.*, *71*, 393-447. doi: 10.3102/00346543071003393.

Good, R. H., Kaminski, R. A., & Cummings, K. (2011). *DIBELS next*. Cambium Learning.

Gupta, R. (2014). Change in Teaching Practices: Case of Phonics Instruction in India. *Procedia-Social and Behavioral Sciences*, *116*, 3911-3915.

Johnston, R., & Watson, J. (2005). The Effects of Synthetic Phonics Teaching on Reading and Spelling Attainment: A Seven Year Longitudinal Study. Available at: http://www.gov.scot/Publications/2005/02/20688/52449.

Kalyanpur, M. (2020). Disrupting the narrative of universality of inclusive education: The new marginalization of low-income, English language learners in India. In *The Educational Forum* (Vol. 84, No. 4, pp. 296-308). Routledge.

Keller-Margulis, M. A., Shapiro, E. S., & Hintze, J. M. (2008). Long-term diagnostic accuracy of curriculum-based measures in reading and mathematics. *School Psychology Review*, *37*(3), 374-390.

Kingdon, G. G. (2007). The progress of school education in India. Oxford Rev. Econ.Pol. 23, 168-195. doi: 10.1093/icb/grm015.

Kurrien, J. (2005). Notes for the Meeting of the National Focus Group on Teaching of English, and Note on Introduction of English at the Primary Stage. *Ms., NFG-English*.

Mishra, R., & Stainthorp, R. (2007). The relationship between phonological awareness and word reading accuracy in Oriya and English: a study of Oriya-speaking fifth-graders. *J. Res. Read., 30*, 23-37. doi: 10.1111/j.1467-9817.2006.00326.x.

Misquitta, R., Shenoy, S., Ghosh, A., & Kotwal, N. (2022). Examining the technical adequacy and efficacy of FABLe to identify students at-risk for reading difficulties in India. *Asia Pacific Education Review, 23*(3), 1-11.

National Council of Educational Research and Training. (2014). *National Curriculum Framework 2005* (No. id: 1138).

Nishanimut, S. P., Johnston, R. S., Joshi, R. M., Thomas, P. J., & Padakannaya, P. (2013). Effect of synthetic phonics instruction on literacy skills in an ESL setting. *Learning and Individual Differences, 27*, 47-53.

Ramachandran, V., Pal, M., Jain, S., Shekar, S., & Sharma, J. (2005). *Teacher motivation in India* (pp. 96-103). Discussion Paper (Azim Premji Foundation, Bangalore, 2005).

Ramanathan, H. (2008). Testing of English in India: A developing concept. *Language Testing, 25*(1), 111-126.

Shenoy, S., Wagner, R.K., & Rao, N.M. (2020). Factors that influence reading acquisition in L2 English for students in Bangalore, India. *Reading and Writing: An Interdisciplinary Journal, 33*(7), 1809-1838.

Stuart, M. (1999). Getting ready for reading: early phoneme awareness and phonics teaching improves reading and spelling in inner-city second language learners. *Br. J. Educ. Psychol., 69*, 587-605. doi: 10.1348/000709999157914.

Stuart, M. (2004). Getting ready for reading: a follow-up study of inner city second language learners at the end of Key Stage 1. *Br. J. Educ. Psychol., 74*, 15-36. doi: 10.1348/000709904322848806.