Senegal

Early Grade Reading Assessment (EGRA)

Results from Senegalese Primary School Students Learning to Read in French and in Wolof—Report for the World Bank

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ABBREVIATIONS

CNRS	National Center for Scientific Research (Centre National de la Recherche Scientifique, France)
EGRA	Early Grade Reading Assessment
GPC	grapheme-phoneme correspondence
IEA	International Evaluation of Educational Achievement
OECD	Organisation for Economic Co-operation and Development
PIRLS	Progress in International Reading Literacy Study
PISA	Programme for International Student Assessment
SD	standard deviation
SES	socioeconomic status
USAID	U.S. Agency for International Development

ABSTRACT

In international assessments (Progress in International Reading Literacy Study–Organisation for Economic Co-operation and Development [PISA-OECD] and Progress in International Reading Literacy Study–International Evaluation of Educational Achievement [PIRLS-IEA]), children's reading skills are not assessed before the fourth grade. For students who are poor readers, it is often too late by this time to carry out efficient and effective remedial instruction. Indeed, to be efficient, remedial instruction should be conducted as early as possible. In addition, most major assessments are only composed of reading comprehension tasks and do not take into account the level of word reading fluency (including accuracy and speed) and listening comprehension. However, research suggests that reading comprehension is associated with capacity in these complementary tasks.

To complement existing international assessments, a new protocol, Early Grade Reading Assessment (EGRA)[1] was developed to assess the main skills that are known to predict reading success within the early grades of primary school (first through third grades). During a workshop held in Dakar, Senegal, the EGRA protocol was adapted to the local context in French, translated into Wolof, and then pretested in several schools. As a result of the adaptation and pretesting process, the EGRA protocol was modified. The protocol used in Senegal includes two comprehension tasks (one written and one spoken), three tasks that assess accuracy and speed in reading high-frequency words (isolated or in context) and invented words (pseudowords), a spelling task, two phonemic awareness tasks, and one task assessing letter knowledge. As part of the EGRA protocol, a survey was conducted that asked questions about the students' cultural and linguistic environment and socioeconomic status (SES).

The EGRA protocol was used to assess Senegalese students learning to read in French (502 children in the first, second, and third grades) and in Wolof (186 children in first and third grades). Three analyses were performed. One involved a comparison between the groups based on their SES and language used in learning to reading. In the second analysis, the pattern of correlations among the tasks was examined. Finally, a regression analysis was carried out to determine the predictors of reading skill level.

The last two analyses indicated that in the two groups (Wolof and French), correlations between SES and various tasks were not significant and that SES does not contribute to variance in reading skills. This was also the case for phonemic analysis and the knowledge of letter names, although correlations between these tasks and the reading tasks were high. Correlations between the pseudoword and word reading tasks were very high, and the ability to read pseudowords was the only skill that explained variance in word reading (isolated or in context). Finally, correlations

[1] EGRA: *Early Grade Reading Assessment* (RTI International for U.S. Agency for International Development [USAID]). For instruments and reports, see www.eddataglobal.org.

between reading and listening comprehension were very high, and listening comprehension was the only skill that consistently explained variance in reading comprehension.

Comparisons within each group indicated that SES was significant only among children learning to read in Wolof. By contrast, having at least one parent who reads was significant only among children learning to read in French. In addition, comparisons between children learning to read in Wolof and those learning to read in French show that, for certain tasks involving spoken language, the former surpass the latter, whereas the opposite was noted for certain tasks involving written language.

The role of the linguistic environment may explain these results. The higher scores in spoken-language tasks obtained by children learning to read in Wolof was probably because most of them speak Wolof at home, whereas few children in the other group speak French at home. On the other hand, the fact that these same children had lower scores in tasks involving written language may be because written Wolof is less developed than written French. This interpretation is reinforced by the lack of incidence of the parent's literacy status (reader or not reader) on the reading scores of the children learning to read in Wolof and by the fact that, in reading tasks, greater floor effects (score = 0) were noted among these children than among children learning to read in French.

The significance of the role of the linguistic environment also emerged from a comparison between the results achieved by Senegalese children learning to read in French and the results from a similar assessment performed with Gambian children learning to read in English. In all the reading tasks, the scores of the Gambian children were lower than those of the Senegalese children. These results replicate those observed with monolingual children and suggest that it is more difficult to learn to read in English than in French, which may be explained by the fact that the relations between graphemes and phonemes are far less transparent in English than in French.

1. INTRODUCTION

In most international assessments,[2] children's reading skills are not assessed before the fourth grade. For children whose reading level is low, it is often too late by this time to successfully conduct remedial instruction. Indeed, to be efficient, remedial instruction should be conducted as early as possible (see Ehri et al., 2001a, 2001b). In addition, most assessments are based essentially on the results of reading comprehension tests and do not take into account the level of listening comprehension or the ability to read words. However, research findings have clearly shown that the level of reading comprehension depends on both the level of listening comprehension and the accuracy and speed in reading isolated words (for reviews, see Perfetti, 1985; Stanovich, 2000).

[2] For OECD, see PISA (2000); for IEA, see Elley (1992) and PIRLS (2003).

For these reasons, RTI International (2007), with support from the World Bank and the U.S. Agency for International Development (USAID), developed the Early Grade Reading Assessment (EGRA) tool. EGRA was designed to assess the main skills that are known to predict reading success for students in the early grades of primary school (first to third grade).

EGRA is designed to be used in various linguistic settings. We know that the degree of transparency of grapheme-phoneme correspondences (GPC) in alphabetical systems affects reading acquisition (Seymour et al., 2003).[3] Therefore, in languages that have transparent spellings (like Spanish and French),[4] progress is more rapid than in languages that have more complex spellings (e.g., English). The degree of transparency in a language's spelling system also has an effect on the reading procedures that are implemented. For example, English-speaking children use top-down lexical representations more than children learning to read in languages in which GPCs are more consistent, probably to supplement error-prone bottom-up processes based on inconsistent GPCs, especially for vowels; and in English (but less so in French, for instance) reading errors more often involve vowels than consonants (for reviews, see Sprenger-Charolles, 2003; and Ziegler & Goswami, 2005). It is necessary to take these linguistic differences into account when performing assessments and to adjust, as much as possible, the difficulty level to the language in which children are learning to read. This is what was done for assessments performed in Senegal and in The Gambia in May–July 2007.

The tests used in the EGRA protocol are those that derive from research conducted about 30 years ago on reading acquisition and that were determined to be the most reliable. These tests, administered individually, help assess accuracy and speed in reading high-frequency words (either isolated or in context), as well as levels of reading and listening comprehension. The set also includes a task that helps assess the student's accuracy and speed in reading pseudowords (invented words, that can be read only by using GPCs), such ability being one of the best predictors of the student's level of reading. In addition, because one needs to recognize phonemes to use grapheme-phoneme relationships, the set includes tasks that help assess the level of phonemic awareness. This set also includes a task on letter knowledge and two tasks on spelling. In addition to these tasks, children were asked to respond to a survey that included questions on their cultural and linguistic environment and socioeconomic status (SES).

This report presents the results of assessments conducted in Senegal late in the 2006–2007 school year that involved about 700 children learning to read in French and in Wolof. Three analyses were performed. The first involved a comparison between the groups based on their SES and language used in learning to reading (French or Wolof). In the second analysis, the pattern of correlations among the tasks was

[3]The basic units of alphabetical writing are the graphemes, which include one or more letter and transcribe the basic units of oral language, the phonemes. In French, the graphemes "a," "i," "ou," and "on" transcribe the vocal phonemes \a\, \i\, \u\, and \ô\, the same way the graphemes "b," "d," "p," "t," "ch," "qu," and "ph," transcribe the consonant phonemes \b\, \d\, \p\, \t\, \$\, \k\, and \f\.

[4]For a statistical analysis of the transparency of GPC in English and/or French, see Peereman & Content, 1998; and Peereman, Lété, & Sprenger-Charolles, 2008.

examined. Finally, a regression analysis was carried out to determine the predictors of reading skill level.

2. METHOD

2.1 Protocol used for the study conducted in Senegal

A workshop was organized in Dakar, Senegal, in April 2007 to introduce the EGRA protocol to Senegalese (and Gambian) officials in charge of teacher assessment and training. English and French versions of the protocol were presented to the participants. The French version was adapted and translated into Wolof and each version was pretested in local schools. After the adaptation and pretesting process, the revised EGRA protocol was used for the intensive assessment outlined below.

Tasks

Pre-reading skills

Concept of print: This task determined knowledge of writing direction in the assessed alphabetical systems. The maximum score was 2 points (1 for the left-right direction and 1 for the top-down direction). Because almost all scores were at the ceiling level, the results of this test were not taken into account.

Knowledge of letter names and/or letter sounds (1-minute task): Knowledge of letter names is recognized as being a predictor of future reading skill level. However, when a child learns how to read, he or she must use GPC, which requires mastery of letter sounds, the sound of a letter being sometimes not the same as its name. For this task, 100 letters were presented on 10 lines (10 letters per line), with the familiar letters repeated most often. Responses were considered correct when a child identified either the letter sound or the letter name. The score was the number of letters or sounds (out of 100) each student correctly identified in 1 minute.

Reading skills: Word reading and comprehension

Reading pseudowords (1-minute task): The student was asked to read 50 pseudowords aloud. The pseudowords were short (2 to 3 letters) and were presented on 10 lines (5 per line). The score was the number of pseudowords correctly read in 1 minute.

Reading familiar words in isolation: The child was asked to read aloud 50 short and simple words (two to five letters and, in French, mostly words with regular GPC) presented on 10 lines (5 per line). The score was the number of words correctly read in 1 minute.

Reading familiar words in context: The child was asked to read aloud a short text of about 60 words with the score being the number of words correctly read in 1 minute.

Reading comprehension and listening comprehension levels: The text used to assess word-in-context reading was also used to assess reading comprehension. After the child read the words in context aloud, the child was asked to answer five simple questions. A similar text was prepared to assess listening comprehension. After the

examiner read the text aloud, the child was asked to answer five simple questions. In both cases, there were two questions with a "yes/no" answer. The scores for the two tests were the total number of correct answers.

Spelling skills

A 10-word sentence was read to the child and the child was asked to write the sentence down word by word. Answers were scored as follows: over three target words, correct orthographically (2 points) or phonologically (1 point); word spacing (0 to 2 points according to the number of spaces); mastery of the direction of the written item (1 point); correct use of a capital letter at the beginning of a sentence (1 point); and correct use of final punctuation (1 point). Two scores were taken into account for the analysis: the scores for the spelling of the three key words and the scores obtained in the four remaining tasks (word spacing, direction of the writing, capitalization, and punctuation).

Phonemic awareness

The student was asked to pronounce each of the sounds he or she could hear in isolated words (identification task) and to count the number of different sounds they contained (counting task). There were nine words of two to four phonemes. Two scores were calculated: the total number of phonemes correctly identified and the total number of phonemes correctly counted.

Surveys

One survey designed for the children included questions about their cultural and linguistic environment (e.g., parents' literacy and language spoken at home) and about their SES (13 items). We created an SES variable based on the total number of yes responses for the 13 items taken into account in the survey (e.g., presence of articles in the home such as water taps, electricity, refrigerators, televisions, fixed-line telephones; and ownership of a car, bike, or mobile phone).

The teachers' practices of instruction were also surveyed, but the results are not analyzed in this report.

2.2 Participants

For children learning how to read in French, the assessments were conducted in the first, second, and third grades of primary school; for children learning to read in Wolof, the assessments were conducted in the first and third grades of primary school (Wolof is used to teach reading skills only in these grades). The assessments were conducted in 32 schools that offered teaching in French and Wolof. Children were selected randomly in each of the schools. Tables 1a and 1b below present the major characteristics of these students.

Table 1a. Children Learning to Read in French: 502 Children

				No Response
Sex: Male (N = 243); Female (N = 258)				N = 1
Grade and Age Mean age (SD) =========> Age 5 . . . . . . Age 6 . . . . . . Age 7 . . . . . . Age 8 . . . . . . Age 9 . . . . . . Age 10 . . . . . . Age 11 . . . . . . Age ≥12 . . . . . . Not indicated	**Grade 1 (N = 150)** 7.4 (1.2) N = 03 (02%) N = 31 (21%) N = 48 (32%) N = 35 (23%) N = 10 (07%) N = 08 (05%) N = 02 (01%) N = 13	**Grade 2 (N = 228)** 8.85 (1.5) N = 03 (01%) N = 22 (10%) N = 85 (37%) N = 54 (24%) N = 28 (12%) N = 12 (05%) N = 13 (06%) N = 11	**Grade 3 (N = 124)** 10.3 (1.4) N = 06 (05%) N = 28 (23%) N = 47 (38%) N = 21 (17%) N = 20 (16.5%) N = 02	
Maternal Enrollment: N = 125 (25%)				N = 1
Koranic School (Dara) Attendance: N = 391 (78%)				N = 1
Socioeconomic Status (Mean and SD): 7.7 (2.6)				
Literate Parents	None: N = 127 (25%)	Only 1: N=172 (34%)	Both: N = 203 (40%)	N = 5
Language of Instruction	French: N = 333 (66%)	Wolof: N = 6 (1%)	Both: N = 156 (31%)	N = 7
Language Spoken at Home	French: N = 37 (7%); plus another language: N = 15	Wolof: N = 415 (83%); plus another language different from French: N = 8	Other: N = 42 (8.5%); other than Peul: N = 15	N = 8

Note: Shaded areas indicate the mean age of the larger parts of the population.

Table 1b. Children Learning to Read in Wolof: 186 Children

				No response
Sex: Male (N = 86); Female (N = 99)				N = 1
Grade and Age Mean age (SD) =========> Age ≤5 . . . . . . Age 6 . . . . . . Age 7 . . . . . . Age 8 . . . . . . Age 9 . . . . . . Age 10 . . . . . . Age 11 . . . . . . Age ≥12 . . . . . . Not indicated	**Grade 1 (N = 84)** 7 (1.3) N = 06 (07%) N = 18 (21%) N = 26 (31%) N = 08 (09.5%) N = 02 (02%) N = 06 (07%) N = 18		**Grade 3 (N = 102)** 10 (1.3) N = 06 (06%) N = 33 (32%) N = 39 (38%) N = 06 (6%) N = 14 (14%) N = 04 (04%)	
Maternal Enrollment: N = 50 (27%)				N = 0
Koranic School (Dara) Attendance: N = 135 (73%)				N = 0
Socioeconomic Status (Average and Typical Gap): 7.5 (2.9)				
Literate Parents	None: N = 36 (19%)	Only 1: N = 78 (42%)	Both 2: N = 72 (39%)	N = 0
Language of Instruction	French N = 3 (2%)	Wolof N = 170 (91%)	Both: N = 13 (7%)	N = 0
Language Spoken at Home	French: N = 5 (3%); plus another language, N = 2	Wolof: N = 163 (88%)	Other: N = 16 (9%); other than Peul, N = 6	N = 2

Note: Shaded areas indicate the mean age of the larger parts of the population.

3. PRESENTATION AND ANALYSIS OF RESULTS

Three analyses were performed. The first involved a comparison between the groups based on their SES and language used in learning to read (French or Wolof). In the second analysis, the pattern of correlations among the tasks was examined. Finally, a regression analysis was carried out to determine the predictors of reading skill level.

For these analyses, scores from the following tasks were considered: phonemic awareness (counting and identification), pre-reading skills (knowledge of letters), reading skills (pseudowords, isolated words, and words in context correctly read in 1 minute), comprehension skills (reading and oral comprehension), and spelling skills (word spelling and other formal aspects of spelling). To facilitate the reporting of the results, the scores were converted into percentages, except the scores for the 1-minute reading tasks.

For comparisons within the groups, the significance of six control variables was examined: gender, grade level, nursery school attendance, language spoken at home, parents' literacy status, and SES. Comparisons between the groups concerned children learning to read either in French or in Wolof. As we had the results of a similar assessment performed on similar school attendance levels and on similar bases for Gambian children learning to read in English, we also compared the results achieved by the Gambian children with those achieved by Senegalese children learning to read in French.

For the correlation analyses, only three control variables were used (age, grade level, and SES). For these analyses, we examined the main correlations between the various tasks and between the tasks and the three control variables. Regression analyses were performed later to determine the predictors of three crucial reading skills: isolated-word reading, word-in-context reading, and reading comprehension.

A review of the data revealed a serious problem related to the reading comprehension tasks. For the task of reading familiar words in context, about one child out of two (45% for the test in French, and 51% for the test in Wolof) was unable to correctly read more than 5 words of the 60-word text in 1 minute. Furthermore, for the reading comprehension task (based on the text used to assess word-in-context reading) 4% (for the test in French) and 8% (for the test in Wolof) of these children achieved scores between 1 and 5 (correct answers to the comprehension questions). However, in the reading comprehension task a child had to read at least 20 words to obtain a score of 1. This problem may be attributed to the procedure used to assess the number of words correctly read for the assessment. The students were allowed to read the text for at least two minutes, but, to allow for a comparison with the other three 1-minute tasks, only words correctly read in 1 minute were coded. Therefore, it is not possible to determine the total number of words of the text that each child actually read correctly. In addition, when the child was unable to read a word after 3 seconds, the examiner would read the word for the child, mark the answer as incorrect, and encourage the child to continue. In cases where the examiner provided a large number of words, the task became a mixture of reading and listening comprehension. Finally,

children might have guessed on certain answers, particularly those for yes/no questions. Consequently, for the correlation and regression analyses, we examined only the reading comprehension scores for children who were able to read at least 20 words in 1 minute, which was the case for 168 children (33.5%) learning to read in French and for 60 children (32%) learning to read in Wolof. This choice was made based on the fact that reading 20 words in 1 minute corresponds to reading two-thirds of the text in 2 minutes or reading the whole text in 3 minutes. However, for comparisons within the groups, we have taken into account the original data.

In almost all other reading tasks, floor effects (score = 0) were also observed. For instance, among first graders learning to read in French, 39%, 27%, and 50% of them were at the floor level for reading pseudowords, isolated words, and words in context, respectively. Surprisingly, a larger proportion of children in the same grade level who were learning to read in Wolof were at the floor level (63% for reading pseudowords and isolated words, and 71% for reading words in context). The same was true for the word spelling scores of first graders: 80% of children learning to read in French and 95% of children learning to read in Wolof were at the floor level. However, for the listening comprehension tasks, 63% of first graders taught in French scored at the floor level, whereas only 26% of those learning to read in Wolof were at the floor level. For the two phonemic awareness tasks, approximately 40% of first graders in both groups had floor-level scores. In contrast, ceiling effects were nonexistent, except for the first pre-reading task.

3.1 Differences within and between groups

Analyses of variance and *t* tests were performed. For the *t* tests, in case of unequal variances, the threshold of significance taken into account was for "equal variance not assumed" ($p < .05$, at least).

Differences within groups

Six control variables were examined, including gender, grade level, attendance at nursery school, home language, parents' literacy status, and SES. For SES, the children were told to answer yes or no when asked about the presence at home of 13 items, including running water, electricity, refrigerator, television set, and car. One point was awarded for each "yes" answer. Based on the children's responses, two groups were formed: those from the lower SES category (SES scores lower than 8) and those from the higher SES category (SES scores equal to or greater than 8). For the parents' literacy status, the participants were also separated into two groups: children reporting at least one literate parent and children reporting no literate parents. According to international assessment results (PISA, 2000, for example), we expected that children from the higher SES category would outperform children from the lower SES category. We also expected that, at least for reading tasks, girls would outperform boys. The other four factors considered likely to have a positive effect on the results included learning to read in the mother tongue, having at least one literate parent, having attended a nursery school, and being enrolled in a higher grade (compared with a lower grade).

Children's socioeconomic status (SES)

Socioeconomic status (SES) had no effect on the results achieved by children learning to read in French. By contrast, among children learning to read in Wolof, those from the lower SES category achieved poorer results than the other children for 3 of the 10 tasks (number of letters, pseudowords, and words read in 1 minute). The results are presented in Table 2.

Table 2. SES: Mean and Standard Deviation

	Children Learning to Read in French			Children Learning to Read in Wolof		
	SES Score ≥8 N = 298	**SES Score <8** N = 204	**Significant Differences**	**SES Score ≥8** N = 101	**SES Score <8** N = 85	**Significant Differences**
Phoneme counting (%)	47.5 (36.3)	45.3 (37.2)		53.3 (37.4)	48.6 (40.8)	
Phoneme identification (%)	53.3 (38.3)	52.8 (36.0)		54.9 (39.2)	46.7 (40.3)	
Letters/minute	29.9 (19.1)	27.6 (18.7)		29.4 (22.8)	22.2 (18.9)	$p < .05$
Pseudowords/minute	14.0 (14.9)	12.7 (14.4)		14.3 (15.5)	9.5 (13.5)	$p < .05$
Words/minute	14.0 (14.5)	12.2 (13.9)		14.2 (15.7)	9,2 (13.6)	$p < .05$ unequal variance
Words in context/minute	18.7 (21.5)	16.7 (20.5)		18.6 (21.0)	13.3 (19.7)	
Reading comprehension (%)	29.1 (33.0)	23.7 (31.5)		35.8 (36.6)	26.8 (36.3)	
Listening comprehension (%)	31.3 (31.1)	27.7 (31.6)		63.9 (31.4)	60.2 (33.0)	
Word spelling (%)	35.2 (40.2)	32.4 (40.4)		18.8 (27.9)	16.1 (30.8)	
Spelling: other (%)	44.2 (28.3)	46.1 (27.7)		35.8 (26.8)	31.3 (26.5)	

Gender

Among children learning to read in French, girls performed better than boys in 4 of the 10 tasks: three involved reading comprehension and spelling, and one involved listening comprehension. Among children learning to read in Wolof, however, there was no difference between the girls' and boys' scores. The results are presented in Table 3.

Table 3. Gender: Mean and Standard Deviation

	Children Learning to Read in French			Children Learning to Read in Wolof		
	Male N = 243	**Female N = 258**	**Significant Differences**	**Male N = 86**	**Female N = 99**	**Significant Differences**
Phoneme counting (%)	46.7 (36.6)	46.2 (36.7)		48.8 (38.9)	53.6 (39.0)	
Phoneme identification (%)	52.7 (37.7)	53.3 (37.0)		51.5 (40.1)	51.2 (39.8)	
Letters/minute	27.6 (18.7)	30.3 (19.1)		25.6 (19.3)	26.8 (23.1)	
Pseudowords/minute	12.6 (14.2)	14.3 (15.2)		12.4 (14.5)	12.0 (15.1)	
Words/minute	11.7 (12.7)	14.8 (15.5)	$p < .01$ unequal variance	12.5 (15.4)	11.5 (14.6)	

	Children Learning to Read in French			Children Learning to Read in Wolof		
	Male N = 243	**Female N = 258**	**Significant Differences**	**Male N = 86**	**Female N = 99**	**Significant Differences**
Words in context/minute	16.0 (19.5)	19.7 (22.4)	p < .05 unequal variance	16.2 (20.5)	16.3 (20.7)	
Reading comprehension (%)	24.3 (31.3)	29.5 (33.4)		30.2 (37.2)	33.3 (36.4)	
Listening comprehension (%)	26.4 (28.9)	33.2 (33.1)	p < .05 unequal variance	61.6 (31.5)	63.0 (32.9)	
Word spelling (%)	29.6 (38.0)	38.2 (42.0)	p < .05 unequal variance	15.9 (28.2)	18.7 (30.0)	
Spelling: other (%)	43.0 (28.1)	46.9 (27.9)		34.7 (26.0)	33.0 (27.5)	

Parents' literacy status

Among the children learning to read in French, those who have at least one literate parent had higher scores in five tasks: number of letters identified in 1 minute, isolated words read in 1 minute, reading comprehension, listening comprehension, and mastery of certain spelling conventions (spacing between words, etc.). Surprisingly, none of the differences was significant among children learning to read in Wolof. The results are presented in Table 4.

Table 4. Parents' Literacy Status: Mean and Standard Deviation

	Children Learning to Read in French			Children Learning to Read in Wolof		
	Reader N = 375	**Nonreader N = 127**	**Significant Differences**	**Reader N = 150**	**Nonreader N = 36**	**Significant Differences**
Phoneme counting (%)	47.9 (36.0)	42.6 (38.5)		52.7 (38.4)	44.7 (41.2)	
Phoneme identification (%)	53.2 (37.4)	52.7 (37.4)		51.8 (40.0)	48.4 (39.5)	
Letters/minute	30.5 (18.8)	24.7 (18.9)	p < .01	26.6 (22.0)	24.2 (18.9)	
Pseudowords/minute	14.1 (14.9)	11.7 (14.1)		12.3 (15.0)	11.3 (13.9)	
Words/minute	14.0 (14.4)	11.1 (13.6)	p < .05	12.0 (15.1)	11.6 (14.7)	
Words in context/minute	18.8 (21.1)	15.2 (20.8)		16.6 (20.6)	14.6 (20.5)	
Reading comprehension (%)	29.3 (33.1)	19.8 (29.4)	p < .01 unequal variance	33.2 (36.8)	25.6 (36.0)	
Listening comprehension (%)	32.4 (31.8)	22.4 (28.7)	p < .01 unequal variance	62.5 (32.5)	61.1 (30.6)	
Word spelling (%)	35.7 (40.7)	29.1 (38.9)		18.6 (30.2)	13.4 (24.5)	
Spelling: other (%)	47.2 (28.6)	38.6 (25.2)	p < .01	34.7 (27.5)	29.9 (22.8)	

Language spoken at home

The assessment of the effect of the language spoken at home was performed only for children learning to read in French (see Table 5), because the majority of the other children speak Wolof at home. In addition, we only compared children who stated that they speak French at home (including those who spoke another language in addition to French) with those who stated that they speak Wolof at home, because the

numbers for other language groups were too small. Except in the spelling tasks, the differences between the groups were significant.

Table 5. Language Spoken at Home: Mean and Standard Deviation (Children Learning to Read in French)

	French (N = 37)	Wolof (N = 415)	Significant Differences
Phoneme counting (%)	63.1 (37.1)	45.8 (36.0)	$p < .01$
Phoneme identification (%)	74.2 (29.7)	50.9 (37.6)	$p < .01$ (unequal variance)
Letters/minute	38.2 (17.8)	28.4 (18.9)	$p < .01$
Pseudowords/minute	23.8 (16.2)	12.6 (14.3)	$p < .01$
Words/minute	22.6 (16.7)	12.5 (13.7)	$p < .01$
Words in context/minute	33.2 (25.6)	16.5 (20.0)	$p < .01$ (unequal variance)
Reading comprehension (%)	49.7 (39.6)	24.9 (31.0)	$p < .01$ (unequal variance)
Listening comprehension (%)	48.1 (38.7)	28.2 (30.5)	$p < .01$ (unequal variance)
Word spelling (%)	44.6 (36.9)	33.7 (40.7)	
Spelling: other (%)	47.6 (26.3)	44.8 (27.9)	

Nursery school attendance

Children who attended nursery school (about 25%, see Tables 1a and 1b) did not score higher than other children. In two cases, they even achieved lower scores: among children learning to read in French for the phoneme counting task (mean: 40.1% vs. 48.8%; SD: 35.6% vs. 36.8%; $p < .05$); and among children learning to read in Wolof for the reading comprehension task (mean: 23.6% vs. 34.7%; SD: 30.7% vs. 38.3%; $p < .05$, unequal variance).

School grade level

Results achieved by children learning to read in French are presented in Figure 1 (150, 228, and 124 children for the first, second, and third grades, respectively). Results achieved by children learning to read in Wolof are presented in Figure 2 (83 and 103 children for the first and third grades, respectively).

Figure 1. School Grade Level: Children Learning to Read in French

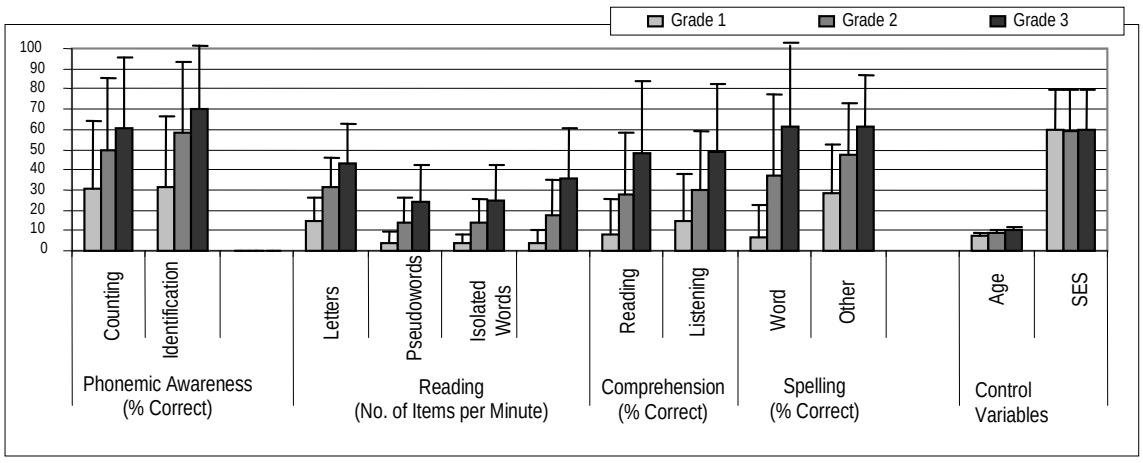
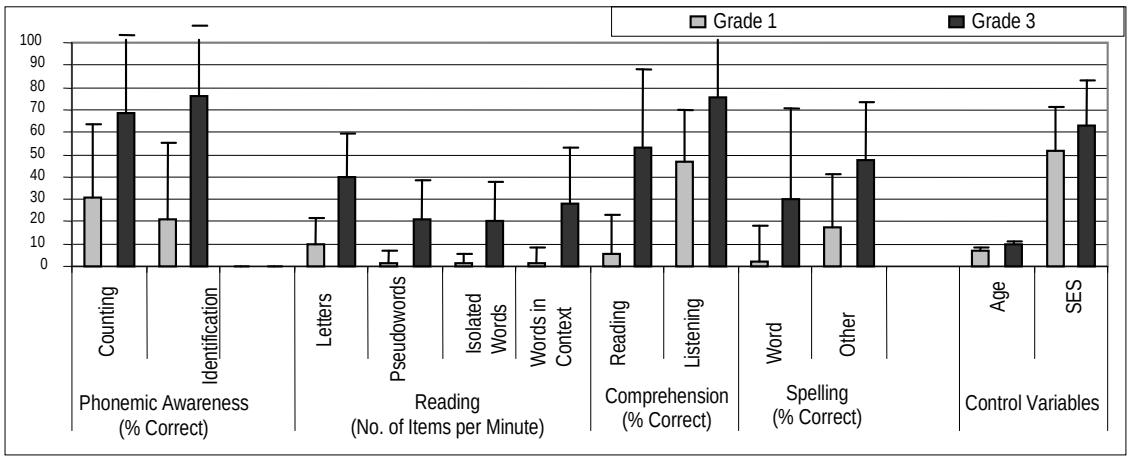


Figure 2. School Grade Level: Children Learning to Read in Wolof



Among children learning to read in French, there were no differences in SES between the groups. Children in higher grades are older than those with lower school attendance levels and systematically achieve higher scores than children in lower grades.

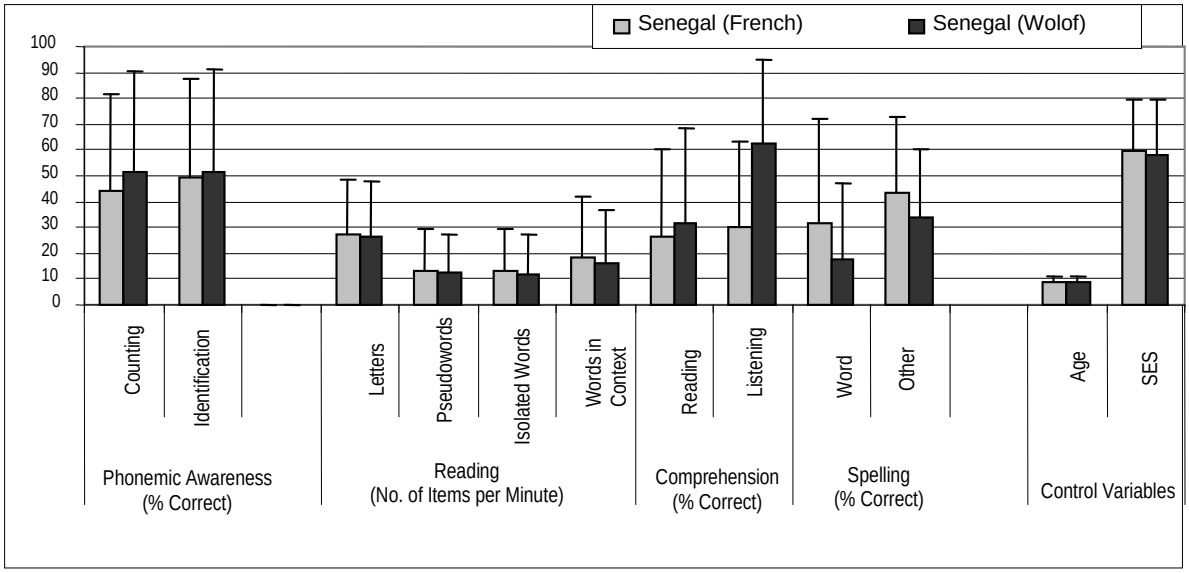
For children learning to read in Wolof, we observed an effect related to age and SES, with the SES for first graders being lower. Even when SES differences were taken into account, the scores achieved by third graders were systematically higher.

Differences between the groups: Language of instruction

Learning to read in French and in Wolof

There were no differences between the groups in terms of age and SES. By contrast, the differences in language of instruction were significant in 4 of the 10 tests: children learning to read in Wolof scored higher for the two tasks that assessed oral language (listening comprehension and phoneme counting), children learning to read in French scored higher for the two tasks that assessed written language (orthographic skills). The results are presented in Figure 3.

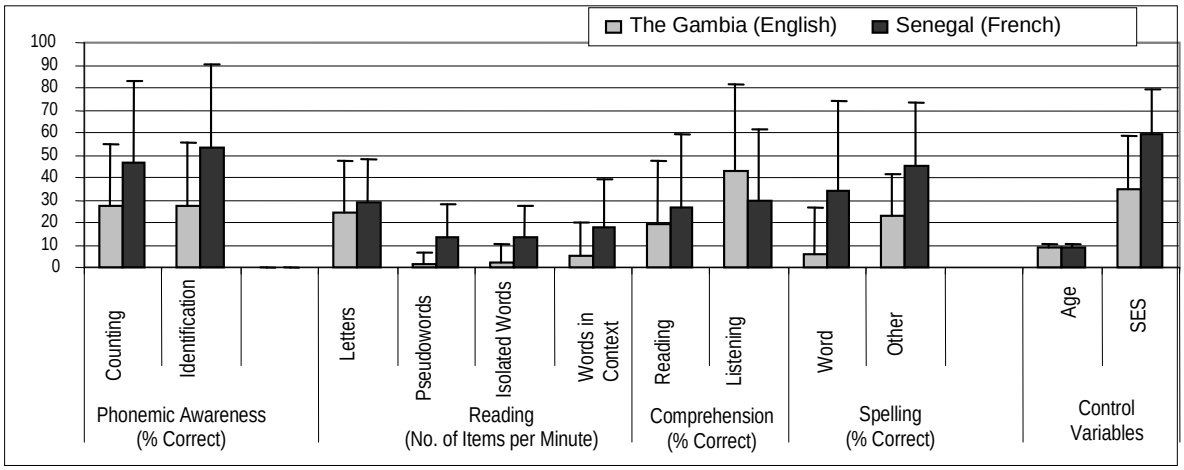
Figure 3. Mean and Standard Deviation for Children Learning to Read in French and in Wolof (Grades 1 and 3)



Learning to read in French (Senegal) and in English (The Gambia)

Because we had the results of a similar assessment with Gambian children learning to read in English, we compared the scores achieved by the Gambian children (1,200) with those of the Senegalese children learning to read in French (see Figure 4). While there was no age difference between the groups, the SES of Gambian children was lower than that of Senegalese children. Even after the effect of SES was taken into account, the scores achieved by Senegalese children learning to read in French were higher than those achieved by Gambian children learning to read in English, except for the listening comprehension test.

Figure 4. Mean and Standard Deviation for Children Learning to Read in French and in English (Grades 1, 2, and 3)



3.2 Correlations and regression

Correlations

A correlation indicates the strength of a relationship between two measures. Thus, we expected to observe high correlations between tasks supposed to assess similar skills: for instance, between word-in-context and isolated-word reading, and between written and spoken language comprehension.

Correlations were calculated between various tasks and between the tasks and three control variables (age, school grade, and SES). For reading comprehension, only children who were able to read at least 20 words of the text in 1 minute were included in the analyses (168 children learning to read in French [33.5%], and 60 children learning to read in Wolof [32%]). The results are presented in Tables 6 and 7.

For the higher correlations, results observed in the two groups were very similar, with three exceptions. First, the phoneme identification task is more strongly correlated with the reading tasks among children learning to read in Wolof than among children learning to read in French, which suggests that this task is very sensitive to the level of mastery of the phonological system of a language. Second, the relationships between listening and reading comprehension were stronger among children learning to read in French (.61 against .45), which indicates that there is more dissociation between the mastery of oral and written language skills for children learning to read in Wolof. Finally, the correlations with grade level were strong for children learning to read in Wolof but not for children learning to read in French, which may be explained by the fact that only children in the first and third grades completed the task in Wolof.

Table 6. Correlations: Children Learning to Read in French

502 Children, Except for the Reading Comprehension Task (168)	1 (PC)	2 (PI)	3 (L/M)	4 (P/M)	5 (MI/M)	6 (MC/M)	7 (RC)	8 (LC)	9 (S1)	10 (S2)
1. Phoneme counting (PC)										
2. Phoneme identification (PI)	***.70									
3. Letters/minute (L/M)	***.43	***.51								
4. Pseudowords/minute (P/M)	***.46	***.53	***.79							
5. Isolated words/minute (MI/M)	***.43	***.51	***.76	***.92						
6. Words in context/minute (MC/M)	***.43	***.51	***.75	***.90	***.92					
7. Reading comprehension (RC)	.17	*.27	.14	.22	*.28	*.30				
8. Listening comprehension (LC)	**.39	***.46	***.45	***.53	***.54	***.58	***.61			
9. Word spelling (S1)	***.45	***.52	***.67	***.76	***.77	***.80	.06	***.53		
10. Spelling: other (S2)	**.39	***.46	***.56	***.55	***.57	***.56	.18	***.49	***.64	
11. Chronological age	.23	*.27	***.42	*.33	*.33	**.34	-.00	.24	**.34	*.26
12. Grade	*.30	**.39	***.56	***.52	***.54	***.56	.13	**.40	***.51	***.43
13. Socioeconomic status	.05	-.00	.07	.04	.04	.05	.07	.11	.04	.00

Note: Correlations that were greater than or equal to .41, .33, and .25 are indicated by ***, **, and *; the thresholds of significance are .001, .01, and .05, respectively, for the correlations involving the smallest number of children (reading comprehension tasks for children learning to read in Wolof [N=60]). The highest correlations (>.60), are highlighted in gray.

Table 7. Correlations: Children Learning to Read in Wolof

186 Children, Except for the Reading Comprehension Task (60)	1 (PC)	2 (PI)	3 (L/M)	4 (P/M)	5 (MI/M)	6 (MC/M)	7 (RC)	8 (LC)	9 (S1)	10 (S2)
1. Phoneme counting (PC)										
2. Phoneme Identification (PI)	***.66									
3. Letters/minute (L/M)	***.51	***.72								
4. Pseudowords/minute (P/M)	***.47	***.71	***.87							
5. Isolated words/minute (MI/M)	***.45	***.67	***.83	***.94						
6. Words in context/minute (MC/M)	***.46	***.69	***.80	***.94	***.91					
7. Reading comprehension (RC)	.07	**.36	-.12	.12	.17	.25				
8. Listening comprehension (LC)	***.44	***.46	**.37	**.34	**.36	**.38	***.45			
9. Word spelling (S1)	**.40	***.55	***.60	***.65	***.64	***.65	**.34	.24		
10. Spelling: other (S2)	***.42	***.49	***.56	***.59	***.59	***.60	.19	*.33	***.51	
11. Chronological age	***.47	***.52	***.53	***.46	***.46	***.47	-.02	*.33	**.37	**.40
12. Grade	***.49	**.70	***.70	***.64	***.62	***.65	.24	***.44	***.47	***.56
13. Socioeconomic status	.02	.10	.17	.18	.20	.19	.06	.11	.10	.17

Note: Correlations that were greater than or equal to .41, .33, and .25 are indicated by ***, **, and *; the thresholds of significance are .001, .01, and .05, respectively, for the correlations involving the smallest number of children (reading comprehension tasks for children learning to read in Wolof [N=60]). The highest correlations (>.60), are highlighted in gray.

Regarding the pattern of correlations, the phonemic counting task was strongly correlated with the phonemic identification task (French: .71; Wolof: .66), and these two tasks were correlated with three reading tasks (pseudowords, isolated words, and words in context; the averages for the counting and identification tasks were .44 and .52 for the tests in French, and .46 and .69 for the tests in Wolof). The letters-per-minute task was strongly correlated with the other 1-minute tasks (averages for pseudowords and isolated words or words in context were .77 and .83 for the tests in French and in Wolof, respectively). Correlations between pseudoword and word (isolated or in context) reading tasks were above .90, no matter which language the children were learning to read in. Between the two tasks involving comprehension (written and oral), the correlations, examined only for children who were able to read at least 20 words of the 60-word text, were .61 for the tests in French and .45 for the tests in Wolof. Finally, between the word spelling task and those tasks used to assess pseudoword and word reading, the correlations were stronger (averages of .78 and .65 for French and Wolof, respectively) than those observed with the other spelling task (.56 and .59 for French and Wolof, respectively).

Regressions

The goal of the regression analyses (based on the correlations) was to identify the predictors of word reading levels (isolated and in context) and reading comprehension. The predictors that we have taken into account are those assessed through the various experimental tasks and through the control variables (age, grade, and SES). We calculated the total part of the variance explained by all predictors and the unique part of the variance explained by each of them. Except for the prediction of reading comprehension, the regression analyses were performed with all of the children.

Predictions for reading isolated words and words in context

Selected predictors included the level of phonemic awareness (counting and identification), the number of letters and pseudowords read in 1 minute, the level of listening comprehension, and the spelling scores. Three control variables (age, grade level, and SES) were also taken into account.

The results for the prediction of reading isolated words are presented in Table 8. For both groups (French and Wolof), more than 85% of the variance in this test was explained by the variables entered into the model. For both groups, again, only pseudoword reading skills added a unique share of explained variance (more than 14%), and less than 1% of the variance in reading isolated words was explained by the contribution of other variables.

Table 8. Prediction of Reading Isolated Words

		Children Learning to Read in French (N = 474)	**Children Learning to Read in Wolof (N = 163)**
Explained Variance: Total		.856	.890
Unique Share of Variance Added			
Socioeconomic status		.000	.001
Chronological age		.001	.001
School grade level		.002	.000
Phoneme counting (%)		.000	.001
Phoneme identification (%)		.000	.000
Letters/minute		.001	.000
Pseudowords/minute		.142*	.146*
Listening comprehension (%)		.001	.002
Word spelling (%)		.008	.001
Spelling: other (%)		.000	.001

*Unique share of variance is significant by at least $p < .01$; the threshold of significance was calculated on the basis of the smaller number of participants (N = 60, reading comprehension for children learning to read in Wolof).

The results for the prediction of reading words in context are presented in Table 9. As in the preceding analysis, for both groups, more than 85% of the variance in this test was explained by the variables entered into the model, and only pseudoword reading skills added a unique share of explained variance: 10.4% for children learning to read in French, and 16.1% for the others. Less than 1% of the variance in the reading of words in context was explained by the contribution of other variables, except in one case: for children learning to read in French, the mastery of word spelling added 2.2% of explained variance.

Table 9. Prediction of Reading Words in Context

		Children Learning to Read in French (N = 474)	Children Learning to Read in Wolof (N = 163)
Explained Variance: Total		.858	.890
Unique Share of Variance Added			
Socioeconomic status		.000	.000
Chronological age		.001	.000
School grade level		.004	.000
Phoneme counting (%)		.000	.001
Phoneme identification (%)		.000	.001
Letters/minute		.000	.003
Pseudowords/minute		.104*	.161*
Listening comprehension (%)		.006	.003
Word spelling (%)		.022	.002
Spelling: other (%)		.000	.002

*Unique share of variance is significant by at least p < .01; the threshold of significance was calculated on the basis of the smaller number of participants (N = 60, reading comprehension for children learning to read in Wolof).

Prediction of reading comprehension level

Because of the low number of children involved in this analysis, only seven predictors could be taken into account: listening comprehension, pseudoword reading, isolated-word reading, words-in-context reading, word spelling, and phonemic awareness (counting and identification). The results (see Table 10) indicate that 35.5% to 41.1% of the variance in the reading comprehension task was explained by the variables entered into the model. Only listening comprehension explained uniquely the variance in reading comprehension (26% for children learning to reading in French, and 9.2% for those learning to read in Wolof). Only one other variable (reading words-in-context) would make a unique contribution, but only among children learning to read in Wolof (5%).

Table 10. Prediction of Reading Comprehension

		Children Learning to Read in French (N = 167)	Children Learning to Read in Wolof (N = 60)
Explained Variance: Total		.411	.355
Unique Share of Variance Added			
Phoneme counting (%)		.001	.014
Phoneme identification (%)		.002	.033
Pseudowords/minute		.001	.022
Isolated words/minute		.005	.000
Words in context/minute		.004	.050*
Listening comprehension (%)		.262*	.092*
Word spelling (%)		.010	.039

*Unique share of variance is significant by at least p < .01; the threshold of significance was calculated on the basis of the smaller number of participants (N=60, reading comprehension for children learning to read in Wolof).

4. SUMMARY AND DISCUSSION

4.1 Summary of the results of the experimental tasks and implications for future EGRA applications

Pre-reading skills

Scores achieved for the letter-reading tasks were correlated with those obtained in reading pseudowords and words (isolated or in context), regardless of the language in which the children were learning to read. However, these scores did not explain uniquely and significantly the variance in the word-reading tasks. This result is in line with those reported in the literature. According to Wagner et al. (1997), for example, when reading skills are taken into account, the knowledge of letter names does not add any significant share of variance in reading.

As already mentioned, the names of letters often differ from their sounds. In many countries, teachers use the sounds of letters instead of their names because relating graphemes and phonemes requires mastery of letter sounds and because using letter names may cause reading errors. Scores obtained in the task assessing letter knowledge were more strongly correlated with the reading of pseudowords and words among Senegalese children, regardless of the language in which they were learning to read (French or Wolof), than among Gambian children (see Sprenger-Charolles, 2008). This result may be explained by the fact that for tasks in French and in Wolof, the name or sound of the letter was accepted as a correct response—and not the name alone, which was the case for the protocol in English. A letter-sound task might thus be more appropriate than the letter-name task.

Nevertheless, given that the results of these two tasks do not explain the reading variance, we suggest that they not be included in the new EGRA protocols. However, because it is crucial to assess the knowledge of the basic visual units of an alphabetic system, these two tasks might be replaced by a task aimed to assess the ability to discriminate true letters (A, a, P, p, B, b) from nonalphabetic symbols (such as ☺, ♣, ✶, 🖉, ♪) and reversed letters (such as Ǝ, Λ, ш, Я, ,ʁ). The inclusion of this task would allow the assessment of visual skills, which are not examined in the current EGRA protocol. This new task would be a 1-minute test and would include 60 letters and 20 signs (10 visual symbols and 10 reversed letters, with 1 to 3 signs, symbols, or letters per line) spread over 10 lines. Two points could be awarded for the correct designation of a reversed letter and 1 point for the correct designation of a symbol.

Reading and writing skills

Reading pseudowords and isolated or in-context words (1-minute task)

Correlations between pseudoword and word (isolated or in context) reading are very high, regardless of the language of instruction. This result signals the existence of a strong link between the phonological reading procedure that may be used to read new words (pseudowords) and the lexical reading procedure that may be used to read high-frequency words. In addition, according to the regression analyses, the reading of

pseudowords is the only variable that uniquely and significantly explained the variance in word reading (whether isolated or in context), regardless of the language in which the children were learning to read.

These results are not in line with Seymour's (2003) double-foundation model of reading acquisition, which is mainly based on results obtained by English-speaking children. They are more in line with some models of reading-skills acquisition based on data from studies conducted for different languages that have a more or less opaque spelling (Sprenger-Charolles et al., 2006; Ziegler & Goswani, 2005). These models grant a crucial role to the mastery of GPC, which according to Share (1995), is the sine qua non of reading-skills acquisition.

Moreover, the floor effects (score = 0) were considerable for the reading of pseudowords, isolated words, and words in context (39%, 27%, and 50%, respectively) for first graders learning to read in French and for a larger proportion of first graders learning to read in Wolof (63% for pseudowords and isolated words, and 71% for words in context).

Therefore, for new EGRA protocols, it is necessary to further simplify these tasks. In particular, one should use only words that have a high frequency, are short, and have regular GPC, especially in the first two lines of the test, in order to help beginners read at least a few words. Likewise, pseudowords should be as short and simple as possible, with regular GPC in the first two lines of the test.

Reading comprehension

As already shown, the reading comprehension task posed a problem. Almost one child out of two was unable to correctly read more than 5 words of the 60-word text used for this task. Furthermore, some of these children achieved reading comprehension scores between 1 and 5, where it was necessary to read at least 20 words to obtain a score of 1. This problem, which may be explained by various reasons (see the beginning of the section devoted to the presentation and analysis of results), guided our choice for the analysis of correlations and regressions, for which we examined only the reading comprehension scores for children who were able to read at least 20 words of the text in 1 minute (about 30% of children in each group, French or Wolof).

The regression analysis indicated that listening comprehension uniquely and significantly explained the variance in reading comprehension in the two groups. An additional significant part of the unique variance was explained by word-in-context reading, but only among children learning to read in Wolof, not for those learning to read in French. This latter result is surprising, because reading comprehension is supposed to depend on both the level of listening comprehension and the ability to read isolated words (accuracy and speed). It may be due to the fact that, in order to correctly assess reading comprehension, we included only the children who were able to read at least 20 words of the text in 1 minute, which reduced the variability of scores.

These problems make it necessary to revise the reading test used for the assessment of both reading words in context and reading comprehension. Instead of a 60-word text, it would be better to use a shorter text of 4–5 sentences with no more than 10 words in

each sentence. The child should read the text first. The time and the number of words correctly read in 1 minute should be recorded as before, with two exceptions: first, the number of words read correctly in 2 minutes should also be recorded; second, when the child is not able to read a word, the teacher should not provide it. Afterward, the sentences should be presented one after the other, with the questions asked immediately after the child reads each sentence. This procedure would help reduce floor effects and lessen the memory load. In addition, it would be preferable to avoid asking questions with yes/no answers and instead ask questions (at least five) that would help assess various levels of comprehension, such as simple questions about remembering a word from a sentence (e.g., the name of a person or a village) and more complex questions asking the child to link various information.

For example, the child could read the following five sentences: "Sidi is 6 years old. His sister, Moussa, is 9. Sidi is racing with Moussa. She arrived first. Sidi is not happy." The examiner will ask a question after the child reads each sentence; for instance, after "Sidi is 6 years old," the examiner could ask, "How old is Sidi?" (memory-related question); after the child has read the sentence "His sister, Moussa, is 9," the examiner could ask, "What is the name of Sidi's sister?" (memory-related question, but more complex than the preceding one). The same process would be used for the other three sentences: after the sentence "Sidi is racing with his sister" is read, ask the question, "What is Sidi doing?" (memory-related question); after each of the last two sentences "Moussa arrived first" and "Sidi is not happy" are read, ask the following questions, "Who won the race?" and "Why is Sidi not happy?" These two questions are more complex and ask the child to establish a link between different information.

Listening comprehension task

For this task, children learning to read in Wolof surpassed those learning to read in French. This result may be explained by the fact that most of these children speak Wolof at home, whereas few children in the other group speak French at home. To verify this interpretation, it is necessary to know the vocabulary level of children in the language in which they are learning to read. A simplified version of a test, such as the Peabody Picture Vocabulary Test, should therefore be integrated in future EGRA applications. For children who are learning to read in a language that is not their native language, the simplest method would be to check their knowledge of the names of more and less known parts of their body (by asking them to point to body parts such as their *nose*, their *mouth*, their *eyes*, their *elbow*, their *chin*, and their *hip*), their knowledge of the names of more and less known objects from the school environment (by asking them to show objects such as a *table*, a *chair*, and a *bench*), and their understanding of spatial terms (by asking them, for example, to put a pencil *under* and *above* a sheet of paper, and then *in front* of him/her and *behind* him/her).

The listening comprehension test is also the only one for which the Gambian children learning to read in English were higher than those of the Senegalese children learning to read in French. This result is surprising for two reasons: first, the SES of the Gambian children was lower than the SES of the Senegalese children, and it is often assumed that linguistic level depends on SES. Second, the number of Gambian

children who reported that they speak English at home was not higher than the number of Senegalese children who reported that they speak French at home. The only explanation may be that the English test was easier than the French test (three questions in the English test vs. five in the French test, with two yes/no questions in each). To verify this interpretation, it is necessary to examine the responses for each of the questions and record only the total number of correct answers.

These problems, like those identified in the reading comprehension task, make it necessary to modify the listening comprehension task and to use a new procedure that is similar to the one proposed for reading comprehension. Compared to the procedure used in this study, the new procedure will help reduce the gap between the two tasks, particularly for the memory load. Indeed, most people can easily speak at least 200 words per minute, which is far from the number of words read in 1 minute by most of the Senegalese participants (an average of 16 and 18 words for children learning to read in Wolof and in French, respectively). For these readers, it is easier to answer questions after the examiner has read aloud a 60-word text than after they have read aloud the same length of text themselves, because it is easier to remember a specific element presented at the beginning of a text after less than 30 seconds than after more than 3 minutes.

Spelling skills

For the two spelling tasks, children learning to read in French achieved better scores than those learning to read in Wolof. This result may be because written Wolof is not as developed as written French; children learning to read in Wolof were therefore undoubtedly less exposed to written Wolof than those learning to read in French were exposed to written French.

In addition, no matter the language in which children were learning to read, correlations between the word spelling task and the pseudoword or word reading tasks were stronger (.64 to .80) than those between the other spelling task (.55 to .60). Only those results obtained in the word spelling task helped predict reading comprehension.

Therefore, the second task had only limited interest in the assessment of reading skills (including reading comprehension) in the first two grades of primary school. In addition, the other spelling task (the word-spelling task) should be significantly simplified because of the floor effects noted among 80% and 95% of children in the first grade learning to read in French and in Wolof, respectively. Only four isolated words should be dictated, with two short and high-frequency words that have regular GPC.

Phonemic awareness

In the phoneme counting task, children learning to read in Wolof scored higher than those learning to read in French. This result is probably because children in the first group, for the most part, speak Wolof at home, while few children in the other group speak French at home.

In addition, correlations with reading skills are higher for the phoneme identification task than for the phoneme counting task, particularly for children learning to read in

Wolof. These results signal that the phoneme identification task was more sensitive than the other in terms of mastery of spoken language and thus helps assess crucial skills for learning to reading. However, the task, as it is designed, caused serious problems. Indeed, it is impossible to sound out a consonant without a vowel.

Therefore, it would be preferable to use a phoneme discrimination task. The goal of this type of task is to assess the ability to discriminate spoken words for which the differences in pronunciation are slight, such as the difference between “pas” and “bas” for the task in French. Assessment of this type of ability, which is necessary for all children learning how to read, is particularly crucial when children are faced with a language that is different from their mother tongue (see Labov, 1972; 1995). In fact, these children have to learn how to discriminate phonemes that do not exist in their mother tongue, and the interference between two phonologic systems may cause errors. In French, this is the case for nasal vowels that do not exist in Wolof and for the phoneme that corresponds to the letter “u” (which is different from the one that corresponds to “ou”). Consequently, Wolof speakers will have difficulties pronouncing these phonemes.

Furthermore, if the phoneme counting task is maintained in the protocol, it would be advisable to avoid using words with phonemes that are not clearly pronounced (e.g., the “e” at the end of a French word or the postvocalic “r” in English words, such as in the word “bird”). Complex diphthongs and consonants should also be avoided (e.g., the sound “ch” in English or in Spanish).

However, theses tasks (especially the phonemic identification task) were very challenging for the enumerators. Consequently, these two tasks could be replaced by another task allowing the assessment of both phoneme discrimination and phoneme segmentation skills: a spelling task involving simple pseudowords. Children should be required to spell two consonant-vowel (CV) and two consonant-vowel-consonant (CVC) pseudowords. As for the phonemic counting task, it would be advisable to avoid phonemes that are not clearly sounded out and complex phonemes such as diphthongs, glides, and affricates. The score would be based on the number of consonants and vowels within each pseudoword that are correctly spelled.

4.2 Control variables: SES, cultural environments, and gender

From the analysis of differences within each group (children learning to read either in French or in Wolof) it appears that children in higher grades always achieve higher results than those in lower grades. This result is less trivial than it may appear. In fact, it was not systematically noted with Gambian children learning to read in English.

Correlations between the SES and the results of various tasks were never significant. It is therefore not surprising that the unique share added by SES was never significant in the two regression analyses in which this variable was used (reading words in isolation and in context). Additionally, in comparisons within each group SES had no effect on the results of children learning to read in French. By contrast, among children learning to read in Wolof, those from a lower SES scored lower than the other children in only a few tests (letter knowledge, pseudoword reading, and

isolated-word reading). It is not too surprising that the SES was of such little importance among children learning to read in a language other than their mother tongue and that among them SES had no influence on the level of spoken language mastery and, above all, on listening comprehension skills. It is difficult to interpret these results without certain tests, however, particularly a test that would help assess the children's vocabulary skill level.

The effect of linguistic factors (language spoken at home and language in which the children were learning to read) seems to be stronger than that of SES. While SES had no effect on the results of children learning to read in French, within this same group, those who speak French at home always had higher scores than those who did not, except for the spelling tasks.

Linguistic environment may also explain the differences observed among the results of the written and spoken language tasks. In certain tasks involving spoken language (listening comprehension and phoneme counting), the scores of children learning to read in Wolof surpassed those of children learning to read in French, while the reverse trend was observed for certain tasks involving written language (spelling tasks). As already mentioned, the first difference may be explained by the fact that almost all children learning to read in Wolof speak this language at home, while few children learning to read in French speak French at home.

The results obtained in tasks that assessed written language may be explained by the fact that written Wolof is not as developed as written French. Consequently, children learning to read in Wolof were probably less exposed to written materials in this language than those learning to read in French. This interpretation is reinforced by the fact that for children learning to read in Wolof, no difference in scores was observed among those who had at least one literate parent and those who did not, while for children learning to read in French, those who had at least one literate parent scored higher in almost all the reading and writing tests. This interpretation is also reinforced by the fact that more floor effects were observed among children learning to read in Wolof than among children learning to read in French, particularly at the first-grade level, that is, at the beginning of the learning process (63% to 71% vs. 27% to 50% for children learning to read in French).

The effect of the language in which children were learning to read is also evident from the comparison between the Senegalese children learning to read in French and the Gambian children learning to read in English. In fact, for the reading tasks, the Senegalese children surpassed the Gambian children. This result confirms those reported in the literature, indicating that the degree of transparency of the orthography affects the acquisition of reading skills (see Seymour et al., 2003; Sprenger-Charolles, 2003; Sprenger-Charolles et al., 2006; Ziegler & Goswami, 2005).

One result was less strongly pronounced than what is expected in this type of assessment (see, e.g., PISA, 2000): the superiority of girls over boys, which was observed only among children learning to read in French and only in 4 of the 10 tasks, 3 of which involved reading or writing words and one that involved listening comprehension. Another result was more surprising: whatever the group (French or Wolof), nursery school attendance had no positive effect on the task results.

5. IMPLICATIONS

In light of the current results and their possible implications for educational policy, the EGRA protocol is more relevant than those used in most international evaluations that examine the comprehension of various types of written texts, mostly for children in the fourth grade and beyond (e.g., PISA-OECD and PIRLS-IEA). However, some improvements to the EGRA protocol are still needed, especially in assessing the skills of children who are learning to read in languages that, in most cases, are not their mother tongues.

5.1 Summary of implications for future EGRA applications

Analysis of the relationship between the language spoken at home and reading skills requires careful consideration of the data concerning this issue. Above all, in the questionnaire for children, the category “other languages” should be removed and the name of each language spoken at home recorded instead. In addition, Arabic language was not mentioned in the questionnaire. This language must be added to the list, because Islamic culture and the use of spoken and written Arabic is widespread in some countries. Finally, as was done for the questionnaire used in The Gambia but not in the one used in Senegal, children should be asked about the language in which their parents read when they are reported as literate.

For reasons already explained in the previous section, some of the EGRA protocol tasks could be deleted (the second pre-reading task and the second spelling task). In addition, the first pre-reading task (assessing letter-name knowledge) could be replaced by a task assessing the ability to differentiate true letters from reversed letters and nonalphabetic symbols. Due to floor effects, other tests need to be drastically simplified (the three 1-minute reading tests and the word spelling test). The reading comprehension task should be revised in order to lessen floor-level effects and to make this task as similar to the listening comprehension task as possible, particularly in regard to the memory load (see the proposal in the previous section). Some tasks should be added to the protocol. A task should assess the vocabulary skill level of children in the language in which they are learning to read (as suggested in the preceding section). Another task should assess phonemic discrimination skills, again, in the language in which the children are learning to read (another suggestion is to replace the two phonemic awareness tasks by a pseudoword spelling task). An assessment of the children’s phonological short-term memory could also be included in future EGRA applications.

More generally, the effects of linguistic environment and the language in which children learn to read make it necessary to select relevant items used in the tasks requiring language processing in order to avoid, as much as possible, certain biases due to linguistic differences. At least two types of controls are necessary. On the one hand, there is the need to control the use of characteristics that are specific to the language of instruction and not to the children’s mother tongue, such as the presence of nasal vowels or the French “u” (as opposed to “ou”) that do not exist in Wolof. A poor control of this type of phenomenon may, in fact, have penalized the reading scores for children who speak Wolof, took the test in French, and may have read, for

example, the words “âne,” “bonne,” and “toux,” instead of the words “an,” “bon,” and “tu” in the first line. On the other hand, it is necessary to fully control the items used in the various tasks so that a comparable level of complexity exists for each of the languages in which the EGRA protocol will be developed. For the reading tasks, this may be easier to achieve for the tasks in French, Wolof, and most other languages, than for the tests in English because GPCs are less consistent in English.

These different controls can be implemented only if descriptive and statistical data are available on the characteristics of the phonological and orthographic systems of the languages concerned. Therefore, summaries of these characteristics must be made available to the local teams implementing the protocol. These summaries can be drawn from existing research (for comparisons between the phonological and orthographic systems of French, English, and Spanish, see Delattre, 1965; Sprenger-Charolles, 2003; and Sprenger-Charolles et al. 2006. For additional descriptive and statistical data on French spelling, see Catach, 1980; and Peereman et al., 2007. For descriptive data on the phonological system of Wolof, see Cisse, 2006).

5.2 Implications for educational policy

This report highlights the fact that reading acquisition depends on the degree of GPC transparency. This is clearly shown by the comparison of results achieved by Senegalese children learning to read in French and those of Gambian children learning to read in English, with the latter systematically achieving the lowest reading scores. Indeed, learning to read in English is very difficult due to the inconsistency between graphemes and phonemes in this language.

Given the crucial importance of mastering grapheme-phoneme relationships in the acquisition of reading, teachers must be aware of the characteristic spelling principles of the language in which they are teaching children how to read. Also, they must use simple, high-frequency words that, as much as possible, include regular GPC. To master GPC, children must be able to discriminate the phonemes of the language in which they are learning to read. Therefore, teachers must have good knowledge of the phonological system of the language in which they are teaching and a good knowledge of the phonological system of the children’s mother tongue. This knowledge will help them understand the possible interferences between phonological systems that may impede not only the acquisition of a new spoken language, but also reading acquisition in that language.

Other results of this study show the difficulties related to establishing educational policy. As noted earlier, children learning to read in Wolof achieved better results than those learning to read in French for tasks involving spoken language. This result may be explained by the fact that almost all the children learning to read in Wolof speak Wolof at home, while few children learning to read in French speak French at home. This point supports a policy that fosters teaching in the mother tongue. However, for certain tasks involving written language, children learning to read in Wolof achieved the lowest scores, which, as already mentioned, may be explained by the fact that written Wolof is not as developed as written French. This outcome is reinforced by the lack of effect of parents’ literacy level on the results achieved by

children learning to read in Wolof, while among children learning to read in French, those who had at least one literate parent achieved higher scores in almost all the reading and writing tasks. Moreover, larger floor effects in reading were observed among children learning to read in Wolof than among children learning to read in French, particularly at the first-grade level. Thus, two policy options are possible: either develop the writing culture in Wolof or continue teaching reading skills to Senegalese children in a language that is not their mother tongue but for which written materials are numerous, diverse, and easily accessible.

A last point to highlight is that in contrast to what was expected and what was observed in The Gambia, nursery school attendance had no positive effect on the results achieved by Senegalese children, whatever the language of instruction. This finding should encourage Senegalese authorities to search for an explanation and, perhaps, to review the curricula used in nursery schools.

Finally, this study provided a new means to help assess reading and related skills as early as the end of the first grade of primary school. Assessments using the EGRA protocol should help teachers identify children who have serious reading difficulties and help them undertake specific pedagogical activities with these children. And to be truly effective, these activities must be conducted as early as possible (Ehri et al., 2001a).

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