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Interactive Reading to Improve Language and Emergent Literacy Skills of Preschool Children from Low Socioeconomic and Language-Minority Backgrounds

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Abstract
Children with low socioeconomic status and language-minority backgrounds generally have weak precursory skills (language and emergent literacy) for learning written language. These skills can be stimulated through interactive reading sessions. Our innovative study for French-speaking Belgium aimed to evaluate the effects of an interactive reading intervention in kindergarten classes, including children with a low socioeconomic status and a language-minority background. The convenience sample consisted of eight schools with differentiated teaching in Brussels city-center. The treatment group, which benefits from interactive reading sessions, include 11 classes (N = 194) and the control group was comprised of eight classes (N = 91). The teachers of the treatment group worked with their class during 30 sessions of interactive reading (3 sessions/week). Pre and post-intervention language and emergent literacy measures were conducted. Children from the treatment group evolved significantly better in postintervention for language (vocabulary, morphosyntax) and emergent literacy skills (print awareness, letter knowledge and phonological awareness), compared to the control group. The implications for kindergarten curricula are discussed.

Keywords Interactive reading · Kindergarten · Intervention · Language · Emergent literacy

Introduction

In many European countries, there are large disparities among pupils with regard to their acquisition of reading. The results of the latest Programme for International Student Assessment (PISA) and Progress in Reading Literacy Study (PIRLS) are particularly troubling (Schillings et al. 2017) for the French-speaking part of Belgium. French-speaking Belgian pupils attending the 4th grade are among the poorest readers within their reference group (i.e., countries in which reading acquisition begins at 6 years) according to the Organisation for Economic Co-operation and Development (OECD). The 2016 PIRLS survey results are significantly (even less satisfactory) more alarming than those of 2011: whatever their characteristics, the scores of all the children fell. A first explanation of these results is the lack of literacy stimulation in many Belgian homes. The part of the Belgian population which declared not having any book at home increased from 9 to 21% between 1985 and 2007.[1] The presence of books in the environment of young children and their appreciation are good indicators of the ease with which they will learn to read (Dehaene 2011). Two other explanations are proposed by Schillings et al. (2017): (1) teaching methods regarding the ability to understand written language are not effective enough, and (2) early literacy skills are insufficiently supported.

In the present study, we tested the effect of interactive reading sessions at preschool on the development of the precursory of reading, language and emergent literacy skills for children from low SES and varied ethnic or linguistic backgrounds of the current Brussels population. In the introduction below, we offer a brief overview of interactive reading

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[1] https://gouvernement.cfwb.be/sites/default/files/nodes/story/7281-cpplanlecture28022015.pdf

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and its effects on children with low SES and language-minority background.

Interactive Reading

Interactive reading (IR), can be defined as *a device that aims at encouraging print exposure and language development on the basis of storybook text while rendering the reading strategies explicit in order to enhance the understanding of a story* [free translation] (Rémy and Leroy 2016, p. 134). IR is popular because (1) it doesn't require many resources, (2) books are easily accessible, and (3) it is also adaptable to children's language needs, communication style, and adult–child relationships (Fitton et al. 2018).

Since 1988, Whitehurst et al. (1988) have described the strategies that increase the adult–child interactions during IR session. The PEER strategies involve: *P*rompting the child to participate in the reading session, *E*valuating the child's responses, *E*xpanding on his/her responses and, finally, *R*epeating the invitation to participate in the discussion and encourage the child to repeat the response. In addition, the CROWD strategies include the various questions that can be asked to the child during reading: *C*ompletion, *R*ecall, *O*pen-ended, *W*h- and *D*istancing questions (i.e., links with the personal experiences of the children) (Lonigan and Whitehurst 1998; Whitehurst et al. 1988, 1994). The use of these strategies has proven their efficiency for less well-prepared children, those who have learning difficulties and who have been identified as at risk for developing language delays or disorders (Chall 2000; Hollingsworth and Ybarra 2013).

Effects of IR on Oral Language and Emergent Literacy

Numerous intervention programs carried out with preschool children who were at risk for reading difficulties, due to diagnosed disability in oral language, low SES, or even with typical development and medium or high SES, have revealed that IR has a positive impact on oral language development (vocabulary, morphosyntax, phonology), emergent literacy (phonological and print awareness, letter knowledge) and literacy development (i.e. the reviews of Mol et al. 2009, Swanson et al. 2011, and Towson et al. 2017). Many studies have been dedicated to the impact of IR on kindergarten *vocabulary* development (Coyne et al. 2004; Dickinson and Smith 1994; Hargrave and Sénéchal 2000; Justice et al. 2005a, b, c; Lonigan and Whitehurst 1998; Wasik and Bond 2001; Wasik et al. 2006) probably because the IR programs propose explanations for targeted words that tend to foster significant vocabulary broadening (Johnson and Yeates 2006). Progress in vocabulary is attributed to the repeated exposure to the words' phonological form as well as to their definitions during IR sessions (Lefebvre et al. 2011).

Concerning *morphosyntactic* development, reading aloud allows young children to become familiar with syntactically and grammatically complex sentences (Mason and Allen 1986). Crain-Thoreson and Dale (1999) and Lake and Evangelou (2019) reported that children exposed to IR programs spoke more and increased their mean length of utterance. IR intervention could also be beneficial in improving the *phonology* of children when phonemes are stressed during reading, in association with specific phonological treatment. The combination of IR interventions and specific treatment could lead to better results than a single direct speech and language treatment without complementary IR sessions (Friberg and Lund 2010; Lawrence 2014). Several authors (Lefebvre et al. 2011; Ukrainetz et al. 2000; Ziolkowski and Goldstein 2008) have also shown that naturalistic instruction of *phonological awareness* during IR sessions leads to an improvement in phonemic awareness skills. More specifically, the first sound identification, last sound identification and sound segmentation tasks have shown clear evidence. Finally, *print awareness* and *letter knowledge* can specifically be stimulated by IR interventions (Justice and Pullen 2003; Lefèbvre et al. 2011; Pullen and Justice 2003; Zevenbergen et al. 2003). For example, Justice et al. (2008) highlighted that preschool children's attention to print increased significantly when adults referred to it verbally or nonverbally (compared to verbatim reading and verbal picture conditions). To sum up, for more than 30 years, multiple IR interventions have demonstrated their efficiency in stimulating oral language skills, while preventing reading difficulties in preschool children with typical development in addition to those with cognitive or linguistic deficiencies or from low SES (Mol et al. 2009; Lonigan and Shanahan 2009; Towson et al. 2017).

IR and Children with a Language-Minority Background

In light of these research results, one may wonder whether IR practiced in the language at school makes it possible to develop language in children who speak another language at home. Several studies have been conducted to measure the effects of IR interventions on children's language development in L1 and L2 simultaneously (Davison and Qi 2017; Guiberson and Ferris 2019; Huennekens and Xu 2016; Pollard-Durodola et al. 2016, 2018; Walsh et al. 2016). Given our field of study and the L2 diversities within the classes we targeted, we will focus our review on interventions in the language at school. Fitton et al.'s recent meta-analysis (2018) highlights the effect of IR in developing language and literacy skills among young children whose scholastic language is a second language. After analyzing 54 studies, they conclude that there is no significant difference in the effectiveness of IR despite the language used during reading: L1-only reading and scholastic language-only reading lead

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to the same effects. Also, regardless of their socioeconomic background, the IR practices seem beneficial to all children. The authors conclude that the use of IR in educational programs seems to be warranted. According to Lipsky (2013), the richness of the explanations provided during IR sessions allows children with mixed language backgrounds to acquire significantly more new vocabulary in their scholastic language. Moreover, Chlapana and Tafa (2014), highlight the importance of an active involvement of language-minority children during reading sessions to acquire vocabulary, in comparison with direct instruction. The quality of the vocabulary instruction proposed during the IR makes the difference and allows these children to catch up to their peers (Lipsky 2013). Language development in childhood, rather than bi/multilingualism, determines scholastic outcomes (McLeod et al. 2016). This is in line with the recommendations made by Goldenberg (2008) for preschool education; there is a need to provide high-quality early childhood classroom practice for children (with or without language-minority background), especially when instruction is given in only one language. Strategies to improve language are those that encourage children to elaborate discussions, expose them to complex vocabulary, and allow them to interact with their teacher (Dickinson et al. 2009). Studies that evaluate the effects of IR on language (other than vocabulary) and emergent literacy skills for children from low SES and language-minority backgrounds remain rare. This is a very large population in our major European cities, with specific needs, therefore justifying more interest from the scientific community. However, IR appears to have an effect on the development of oral language, including children who speak other languages at home and with low SES.

The Present Study

This study is part of a wider research project on the impact of interactive reading on children of low SES and parent–child interactions, supported by the Université libre de Bruxelles (ULB, Brussels, Belgium). The goal was to document the impact of an IR intervention program in kindergarten on language and emergent literacy skills in children of the city-center. Brussels' inner-city is characterized by a low socio-economic population and is also the main place of arrival for mixed and European international immigration. Children attending inner-city schools present two risk factors in written learning: low SES and low skills in the language of instruction (Lefèbvre and Giroux 2010; Locke et al. 2002).

We chose to work in natural educational settings, with the regular teacher and the whole class, to examine the transferability of IR strategies to low SES children who do not have a good command of the classroom language (French). Children who receive IR will be compared to children from the same socioeconomic level who did not receive IR. If the results show a positive effect, this could be an argument for adopting IR as a policy to prevent literacy difficulties.

Method

The study was approved by the Faculty Ethics Committee of the Université libre de Bruxelles. It followed a quasi-experimental design with pre- and post- evaluation phases of the intervention. Two groups were formed, the treatment (TG) and the control (CG) groups.

We first contacted the municipal councilor of Education of Brussels inner city for consent and the recruitment of the participants was made in collaboration with him. The schools that answered positively were included in the study, thus creating a convenience sampling of the population.

Participants

Schools

The educational inspector recruited nine schools. All of them, except one, benefit from *differentiated teaching*. Differentiated teaching is a procedure established by the Belgian decree of June 30th, 1998[2] in order to provide all pupils with equal opportunities of social emancipation, notably by giving additional resources (financial, equipment and/or human) to schools attended by children with low SES. Every 5 years, an interuniversity study establishes the *socioeconomic index* of sub-regions for the French Community based on a formula considering income per-resident, level of Education, unemployment rate, professional activities and housing comfort. The aim of this procedure is to strengthen the education, fight against academic failure, favor rapid detection of school difficulties, and prevent early school drop-out.

In order to homogenize the socioeconomic level of the groups, the school which did not benefit from differentiated teaching was not included. Each of the eight schools recruited for the study had a socioeconomic index lower than five (threshold for benefiting from differentiated teaching). The distribution of the classes between the two groups was made according to the years of experience of the teachers (TG: $M = 17.1$, $SD = 5.1$; CG: $M = 18.25$, $SD = 6.0$). All classes of each school had to join the same study group (treatment or control) in order to prevent them from exchanging information about the study.

[2] https://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=fr&la=F&table_name=loi&cn=1998063039

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Table 1 Descriptive analyses (means and standard deviations) and *t* test of the teachers from the treatment (TG) and control (CG) groups

Variable	TG ($n=11$) *M (SD)*	CG ($n=8$) *M (SD)*	*t*	*p*-Value
Age	40.75 (7.80)	41.57 (7.87)	.203	.843
Years of experience	16.13 (7.51)	16.57 (7.96)	.112	.913
Reading frequency	2.13 (0.35)	2.29 (0.49)	.738	.474
Reading intensity	1.63 (0.52)	1.71 (0.49)	.342	.738
Pauses to explain the story	2.38 (0.52)	1.86 (0.69)	− 1.658	.121
Pauses to explain vocabulary	2.63 (0.52)	2.86 (0.38)	.978	.346
Pauses to stressed letters	1.63 (0.74)	1.57 (0.54)	.158	.877

Teachers

Before the intervention, 15 teachers out of 19 filled out a questionnaire (four teachers never returned their questionnaire, in spite of reminders) and a written consent form indicating their agreement to participate in the study. We used the independent-samples *t* test to control age, years of experience, frequency of reading sessions in their classes, intensity of the reading sessions or how many times the same book is read, frequency of breaks to explain the story, address vocabulary, or stress the letters. At the pre-intervention stage, there were no significant differences between the treatment and the control group for any of these variables (Table 1).

Children

The study was incorporated into the school's educational project. IR sessions were part of the curriculum, so that all the children from the kindergarten classes were included at the beginning of the study. Because there were 11 classes in the TG and eight in the CG, and because there were some vertical classes (2nd year of the preschool and kindergarten) in the CG, we had an unequal number of children in the two groups. There were 194 children in the TG and 91 children in the CG. All children were born in 2010, they were aged from 57 to 68 months for the TG and from 56 to 68 months for the CG. The sample consisted of 147 girls and 138 boys.

The parents signed consent forms to allow their children to participate in the study and were asked to fill in background information questionnaires, 63% of which were sent back to us after two reminders. We used independent-samples *t* tests or chi-square tests to compare children from both groups with regards to gender, number of books at home, age of the first parent–child reading session, language background and the parent's highest academic degree. Although all children were born in 2010, we observed a significant difference of 1 month between the treatment and the CG. Other variables showed no significant difference between the two groups. The data are summarized in Table 2.

Our population is socioeconomically disadvantaged, widely multicultural and multi-ethnic: it numbers approximately 35 different nationalities, as well as around 30 different native languages (or dialects spoken in the family), which is representative of our global and diverse society. On

Table 2 Descriptive analyses (means and standard deviations) and *t* test/X^2 of the children and of their environment from the treatment (TG) and control (CG) groups

Variables	TG *M (SD)* or %	CG *M (SD)* or %	t/X^2	*p*-Value
Age	62.68 (3.40)	61.78 (3.30)	2.096	.037
Age group				
Younger (≤ 63 months)	56.7%	70.3%	4.839	.028
Older (> 63 months)	43.3%	29.7%		
Gender				
Girls	52.1%	50.5%	.057	.812
Boys	47.9%	49.5%		
First book (age)	2.33 (1.3)	2.54 (1.5)	.848	.398
Number of books at home				
0–5	22.4%	31.9%	5.235	.264
6–25	36.6%	44.7%		
26–50	22.4%	10.6%		
51–100	10.4%	8.5%		
> 100	8.2%	4.3%		
Language background				
Mono	29.2%	28.2%	.015	.901
Bi/multi	70.8%	71.8%		
Parents highest degree				
Father				
Low*	32.8%	52.5%	5.005	.082
Middle**	27%	20%		
High***	40.2%	27.5%		
Mother				
Low*	28.3%	36.8%	5.221	0.73
Middle**	22%	34.2%		
High***	49.6%	28.9%		

Age group: The age groups are determined according to the standards of Exalang 3–6 (see below, measurements)

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January 1, 2019, the Brussels population consisted of 35% non-native speakers.[3] Belgium is a country with (one of) the highest proportions of non-native speakers in the total population, compared to other countries of the European Union.

Intervention Program

The program is a preventive intervention and is aimed at stimulating the precursory factors of written language (i.e., oral language and emergent literacy skills). The intervention was carried out in class by the regular teacher in order to favor a natural intervention context. Our project lasted 8 months, from October to May, testing periods (1–3 weeks in pre and post-intervention) and school holidays included. The intervention phase itself lasted 10 weeks.

At the beginning of the school year, we first met with teachers, at their schools, to explain the context and the project's goals. Then, they received the instructional manual and had 2 weeks to plan an IR session. Finally, we met again at their school for a question/answer session. The first researcher was always available for consultation during the 10 weeks of the intervention.

The program was inspired by several programs having proven their effectiveness: *Parler–Bambin* (Bloyet et al. 2014), *Read it again!* (Parkes 2000), *ABC and Beyond* (Weitzman and Greenberg 2010), *La lecture partagée enrichie* (internal training, Lefèbvre 2016), and *Scaffolding with Storybooks* (Justice et al. 2005b). Given the Belgian school context (i.e., little/no opportunities for continuing education, high number of children per class, one teacher per class), our intervention program was delivered through a self-instructional support. This support explained (1) the objectives and the context of the intervention, (2) provided a variety of advice ranging from planning the sessions (including an explanation about book selection and targeted concepts), to the environmental adaptations during the sessions, to the child-teacher relationship needed in order to ensure a positive climate, and (3) illustrated two reading sessions. The program was pre-tested with six kindergarten teachers from two other schools and some practical information was modified following their feed-back.

The teachers had to read ten different books over a 10-week period (1 book per week). The reading sessions were repeated three times a week (30 reading sessions in total). The books used for the 10 weeks were chosen by the teachers themselves in order to favor a natural intervention context, to promote pleasant reading and shared pleasure, and to respect the sensitivity of each teacher. Thus, books could be different from one teacher to the next. During the pre-intervention phase, the quality of the book selected for a classroom reading session was assessed by the first researcher using a 10-item list, divided into three categories: narrative content, printed characters, and physical characteristics (Ezell and Justice 2000; Justice and Ezell 2000; Justice and Kaderavek 2002; Justice et al. 2005a, b, c; Lane and Wright 2007; Lefèbvre et al. 2011). The independent *t* test showed no significant differences between the groups ($t(11) = 0.306$, $p = 0.763$). The teachers of the TG ($M = 6.27$; $SD = 0.79$) did not select higher quality books than those of the CG ($M = 6.46$; $SD = 1.81$).

The teachers were free to choose their language targets and their strategies, according to the level of their pupils. The concepts targeted vocabulary (3 targets), story understanding (3 targets), print awareness (3 targets), and phonological awareness (3 targets).

– *Vocabulary*: teachers were invited to choose words less commonly used in everyday life but often found in books (e.g., literary/complex vocabulary). Strategies proposed for developing vocabulary were to show the word on an illustration or in reality, to mimic the word, to define the word and add details or propose synonyms, to use the word in another context, to make links with the everyday life of the children, to ask the children to repeat the word, and to speak, using the word again during the day.
– *Story understanding*: proposed strategies were to explain elements of the story, evaluate actions of the characters, make predictions, make links with the personal experiences of the children, discuss the feelings of the characters, try to solve the problem which appears in the story, or to imagine another version of the story.
– *Print knowledge*: the title of the book was used to describe one letter.
– *Print awareness*: several concepts were proposed such as the function (i.e., hold the book correctly, read from the beginning until the end), the vocabulary bound to books (i.e., author, illustrator), and concepts of words/sentences/letters (i.e., from left to right, short/long, recognition with various places in the book).
– *Phonological awareness*: teachers had to choose one target per week: syllable, rhyme, or phoneme. For every target, tasks were proposed: for example, to identify whether a syllable belongs to a word, to detect if two words rhyme, or detect if two words begin with the same sound.

The program of the sessions was inspired by Lefèbvre et al. (2011), with different kinds of sessions during the week. The first session was called *adult day*. It consisted of reading the book with varied explanations of the selected targets (e.g., to bounce: it means jumping, certain animals bounce such as the rabbit, the tiger, let's all bounce together). The second session, called *errors day*, required the children

[3] https://bestat.statbel.fgov.be/bestat/crosstable.xhtml?view=c1649c18-ea66-4286-9310-2413e74134f8

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Table 3 Tests and subtests used for the pre and post evaluation

Tests	Subtests	Tasks	Number of items
EXALANG 3–6 (ThibauLt and Helloin 2006)	*Expressive vocabulary*	Image naming	36
	Receptive vocabulary	Image designation	36
	Expressive morphosyntax	Complete a sentence	24
	Receptive morphosyntax	Image designation	15
	Expressive phonology	Non-word repetition	12
	Receptive phonology	Discrimination of minimal pairs	10
BELO (Pech-Georgel and George 2006)	*Basic mechanisms*	Letters denomination	26
	Phonological awareness	Syllables segmentation	16
		Judgment of rhymes	
		Syllables inversion	
		Initial phoneme identification	
EVALO 2–6 (Coquet et al. 2009)	*Reading awareness*	Concepts recognition	4
	Print awareness	Recognition of French sequences	6

to detect the errors deliberately committed by their teacher during the reading (e.g., suggest an opposite explanation for a word, make an incorrect inference, hold the book back to front). The errors were related to the objectives targeted during the first reading session (e.g., to bounce: it means to crawl, and the teacher mimes crawling). During the third session, called *questions day*, the teacher asked three children of the class questions, in relation to the targets (e.g., to bounce: "Can you explain the words 'to bounce'?"). Finally, the book was available in class to be freely manipulated by the children.

The teachers of the CG read to their pupils three to five times a week, ritually, in a traditional way. By traditional reading, we mean that the teacher reads to the children but without any targeted interruptions.

Reading sessions (traditional or interactive) were offered to the entire class group by their regular teacher. Interactive reading was unknown to all teachers (treatment and control) at the beginning of the research. After the intervention, all information relating to the IR intervention was transmitted to the teachers of the CG.

Measurements

Each school benefited from 2 to 8 school days of assessment, according to the number of children who needed to be evaluated. Whenever possible, schools were visited by the first experimenter in the same order in pre- and post-intervention. The children were individually evaluated, during school time. Testing lasted 25 to 35 min. Oral consent was asked of the child before each assessment ("*Do you agree to do some exercises with me?*") and a form was completed by the evaluator. Language skills such as vocabulary, morphosyntax and phonology, were tested with Exalang 3–6 (Thibault and Helloin 2006). Literacy skills (print awareness, phonological awareness, and letter knowledge) were evaluated with Evalo 2–6 (Coquet et al. 2009) and BELO (Pech-Georgel and George 2006). These are all standardized and calibrated tests for the target age group. The tests and subtests are described in Table 3.

Reliability of Evaluations and Intervention

Evaluations

Children were evaluated individually in a quiet location at school, outside the classroom, by the first researcher or by one or two master's student(s). When two or three children were assessed individually but at the same time and in the same place, the tests were administered in a random order so that no child could be influenced by another child's responses. Master's students had been familiarized beforehand with the standardized tests and every 1st day evaluation was directly supervised by the first researcher.

Intervention

To control the implementation of the intervention in the class, the teachers had forms to complete at each reading session. The forms included the title of the book, the duration of the reading sessions, the name of the absent children and the description of the language targets. Nine out of 11 teachers in the TG returned their forms. Among the two teachers who did not fill in the forms, one was sick for the rest of the school year and the other one never answered our requests.

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Table 4 Descriptive statistics for the quality of the books chosen by the teachers

Teachers	Text *M (SD)*	Prints *M (SD)*	Physical *M (SD)*	*N*
1	4.60 (0.52)	0.90 (1.20)	1.80 (0.42)	10
2	4.60 (0.52)	0.90 (1.20)	1.80 (0.42)	10
3	4.67 (0.50)	0.44 (0.73)	1.89 (0.33)	9
4	4.67 (0.50)	0.44 (0.73)	1.89 (0.33)	9
5	4.38 (0.74)	1.75 (1.28)	2.00 (0.00)	8
6	4.13 (0.64)	1.50 (1.41)	1.88 (0.35)	8
7	4.38 (0.75)	1.13 (1.13)	1.63 (0.52)	8
8	4.38 (0.75)	1.13 (1.13)	1.63 (0.52)	8
9	4.38 (0.75)	1.13 (1.13)	1.63 (0.52)	8

Text = age-appropriate, number of pages, image/text balance, repetitive or plausible narrative structure, lovable characters; Prints = large letters, prints into images/bubbles, mixed fonts; Physical = large format, images close to reality

To start, we analyzed the differences between teachers of the TG in terms of duration of reading and the number of absent children during the readings. Six teachers completed the forms about the duration. The duration varied significantly between teachers ($F(5,124) = 26.71$, $p < 0.001$, $\eta^2 = 0.519$), with an average of 24 min ($SD = 4$ min, min = 15, max = 40). Concerning the number of absent children, seven teachers completed these forms. The number of absent children did not differ significantly between classes ($F(6,179) = 1.62$, $p = 0.145$).

We also checked the teachers' preparation regarding the language objectives related to target words during the reading sessions. We allocated one point for each correct objective (e.g., for vocabulary: 0.33 points by word, with a maximum of three different words for one book). A score was calculated for each objective. All teachers obtained scores > 0.80; five teachers out of nine always obtained the maximum score. A total score, based on the set of objectives, was also calculated. All teachers obtained a score > 0.90, which is excellent.

Finally, we analyzed books chosen by the teachers (total = 90 books, all titles). We were able to analyze 85.7% of books (80% minimum for each teacher). Some titles were used by several teachers, so we analyzed 36 different titles of a total of 42 different books (the six remaining titles were unavailable in library). The homogeneity of the quality of the books among the teachers was evaluated with three main criteria, adapted from those of Ezell and Justice (2000), Justice and Ezell (2000), Justice and Kaderavek (2002), Justice et al. (2005a, b, c), and Lefèbvre et al. (2011). The criteria concerned the text of the book (max = 5), the print (max = 3), and the physical characteristics (max = 2). The mean score for the three criteria as a function of teacher appears in Table 4. There were no significant differences between teachers concerning the criteria used to choose their books, nor regarding the quality of the text ($F(8,69) = 0.72$; $p = 0.672$), nor the print ($F(8,69) = 1.26$; $p = 0.279$) nor the physical characteristics ($F(8,69) = 0.93$; $p = 0.496$).

Results

The results are presented in three sections. First, we analyze the correlation between age and pre-test results considering the significant age difference between our two groups. Second, we present the results of the pre-tests for both groups. Third, we compare the post-test scores of the treatment ($N = 194$) and the control ($N = 91$) groups.

Age

Age was significantly correlated to all pre-test results (vocabulary: $r = 0.233$, $p < 0.001$; morphosyntax: $r = 0.217$, $p < 0.001$; phonology: $r = 0.106$, $p = 0.036$; print awareness: $r = 0.299$, $p < 0.001$; phonological awareness: $r = 0.236$, $p < 0.001$; one-tailed), except for letter knowledge for which the correlation was marginally significant ($r = 0.097$, $p = 0.051$; one-tailed).

Pre-Test Results

Groups showed significant differences at pre-intervention time for all variables (vocabulary: $F(1,275) = 179.04$, $p < 0.001$, $\eta^2_p = 0.394$; morphosyntax: $F(1,275) = 115.24$, $p < 0.001$, $\eta^2_p = 0.295$; phonology: $F(1,275) = 25.79$, $p < 0.001$, $\eta^2_p = 0.086$; print awareness: $F(1,275) = 54.61$, $p < 0.001$, $\eta^2_p = 0.166$; letter knowledge: $F(1,275) = 94.55$, $p < 0.001$, $\eta^2_p = 0.256$; phonological awareness: $F(1,275) = 30.15$, $p < 0.001$, $\eta^2_p = 0.099$). The TG performed better than the CG on all variables, except phonology.

Effect of Intervention

On each dependent variable, we ran a covariance analysis with IBM SPSS© (ANCOVA, type I model, to balance the marginal means by the size of the groups) with a significance level of 0.05. The *dependent variables* were the scores obtained in the post-tests for vocabulary, morphosyntax, phonology, letter knowledge, phonological awareness and print awareness. To reduce the number of dependent variables, the receptive and expressive scores that were highly correlated, were pooled for each language domain (for vocabulary: $r = 0.666$, $p < 0.001$; for morphosyntax: $r = 0.414$, $p < 0.001$; for phonology: $r = 0.232$, $p < 0.001$). Print and reading awareness were also pooled ($r = 0.380$, $p < 0.001$) under the term *print awareness* (max = 10). Finally, letter knowledge (max = 26) and phonological

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Table 5 Descriptive statistics for treatment (TG) and control (CG) groups

Variables		TG $N=194$		CG $N=91$	
		M (SD)	Range	*M (SD)*	Range
Vocabulary	PRE	64.14 (7.71)	20–72	61.62 (9.38)	35–72
	POST	68.26 (4.75)	39–72	67.13 (4.98)	48–72
Morphosyntax	PRE	23.32 (6.76)	4–38	21.59 (7.16)	5–34
	POST	29.10 (5.69)	8–38	27.73 (5.35)	14–38
Phonology	PRE	16.11 (3.14)	5–22	16.68 (2.90)	7–22
	POST	17.94 (2.72)	10–22	17.55 (2.36)	12–22
Letter knowledge	PRE	3.47 (4.65)	0–23	2.41 (3.75)	0–19
	POST	7.82 (6.42)	0–25	6.25 (5.90)	0–24
Print awareness	PRE	4.50 (2.29)	0–10	4.28 (2.08)	0–9
	POST	6.44 (2.12)	0–10	5.96 (2.10)	1–10
Phonological awareness	PRE	6.84 (3.53)	0–15	5.89 (3.08)	0–14
	POST	9.58 (3.74)	0–16	8.71 (3.12)	1–15

awareness (max = 16) stayed as they were. The *independent variables* were the group (treatment–control) and the school (one to eight). As *covariates* we used the children's age and the pre-test results because treatment and control groups significantly differed in age and in pre-intervention scores.

The covariance analyses on post-test scores yielded better results for the treatment than for the control group for *vocabulary* (TG: adjusted $M = 67.95$, $SD = 0.27$; CG: adjusted $M = 67.79$, $SD = 0.40$—$F(1,275) = 5.46$, $p = 0.020$, $\eta^2_p = 0.019$), *morphosyntax* (TG: adjusted $M = 28.79$, $SD = 0.34$; CG: adjusted $M = 28.37$, $SD = 0.49$—$F(1,275) = 5.45$, $p = 0.020$, $\eta^2_p = 0.019$), *letter knowledge* (TG: adjusted $M = 7.50$, $SD = 0.39$; CG: adjusted $M = 6.93$, $SD = 0.57$—$F(1,275) = 5.43$, $p = 0.021$, $\eta^2_p = 0.019$), *print awareness* (TG: adjusted $M = 6.40$, $SD = 0.14$; CG: adjusted $M = 6.05$, $SD = 0.20$—$F(1,275) = 3.97$, $p = 0.47$, $\eta^2_p = 0.014$) and *phonological awareness* (TG: adjusted $M = 9.42$, $SD = 0.24$; CG: adjusted $M = 9.00$, $SD = 0.35$—$F(1,275) = 3.98$, $p = 0.047$, $\eta^2_p = 0.014$). The covariance analysis did not yield a group difference on *phonology* (TG: adjusted $M = 19.95$, $SD = 0.18$; CG: adjusted $M = 17.54$, $SD = 0.26$—$F(1,275) = 1.57$, $p = 0.212$) with both groups improving in post-intervention. Descriptive statistics for both groups can be found in Table 5.

The school factor was used to account for the nesting of students within schools but did not reach the significance threshold and explained only 1.2–3.9% of the variance across all variables, except for *letter knowledge* ($F(6,275) = 2.64$, $p = 0.017$, $\eta^2_p = 0.054$). The contrast analysis (Helmert) showed significant differences between the three schools of the CG only: one school (number 7) showed significantly better results in post-test ($M = 9.88$, $SD = 7.09$) than the two others (number 1 and 9) ($M = 4.74$, $SD = 4.97$ and $M = 5.03$, $SD = 4.57$, respectively).

Discussion

The object of our study was to test the impact of IR on children from low SES backgrounds, whose home language was different from their scolastic language, in most cases.

We decided to work in a natural context, with all the children of a class without distinction. No exclusion criteria, such as the initial language level, were used. The intervention was conducted with kindergarten children in classes with differentiated teaching (low SES), by their regular teacher. We worked with a convenience sampling and two groups, a treatment and a control group. The children's and the teachers' characteristics were similar for both groups. Only the children presented a significant difference for age (on average, 1 month older for the children of the TG). Based on the first researcher's analysis of the questionnaires filled out by teachers (books chosen and preparation of the targeted concepts), the intervention showed a good level of reliability.

Concerning the effects of the IR intervention program, we expected an improvement in oral and emergent literacy skills for the children from the TG after the sessions. More specifically, larger increases in vocabulary, phonological awareness, letter knowledge, and print awareness were expected for the TG than for the CG. The results show that these variables had higher improvement at post-test for the children from the TG than for those of the CG, while the scores of the two groups were adjusted at pre-test. Our results, obtained from a population with low SES and a mixed language background, consolidate the results previously obtained by several studies conducted by different research groups (Hargrave and Sénéchal 2000; Justice and Pullen 2003; Lefebvre et al. 2011; Zevenbergen and Whitehurst 2003; Ziolkowski and Goldstein 2008), and extend results of other research teams working with

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children with a typical development or a diagnosed language delay (e.g. Crain-Thoreson et al. 1992; Dale et al. 1996; Sénéchal et al. 1993; Ukrainetz et al. 2000).

Phonology did not show significant differences between groups, but this lack of effect is not surprising considering that no directive had been given to stress phonemes during the reading (Lawrence 2014) or to direct the choice of books towards those containing more difficult specific phonemes (Friberg and Lund 2010).

We observed significant differences between TG and CG on morphosyntax and letter knowledge, to the benefit of the TG, but these two abilities were not specifically targeted during IR sessions. An interpretation of the improvement displayed by the TG would be that simple exposure to more grammatically complex sentences delivered in IR enabled children to significantly improve their morphosyntactic skills. This supports observations made by Mason and Allen (1986), suggesting that caregivers' awareness of attitudes, which facilitate language and active participation of children during IR session (where they are encouraged to speak about language), enables an improvement in language skills (Girolametto et al. 2003; Goldenberg 2008; van Druten-Frietman et al. 2016). The same interpretation applies to letter knowledge. As explained by Mol et al. (2009), although teachers were not trained to refer to print, letter knowledge can be stimulated by an IR program (Justice et al. 2008). During IR, teachers make more references to the text (e.g., utterances in text balloons, rhyme), the physical characteristics and the print (e.g., sizes and types) than during a traditional reading session. As the same book is read several times, the child can explore other details of the printed text, such as letters, step by step.

Analyses are significant for several language and emergent literacy skills, but the effect sizes are very low (< 5%). While such effects are rarely mentioned in the literature (Justice and Pullen 2003), several elements could explain these low effect sizes. First, effects are generally small for this type of intervention (Dickinson et al. 2011). Second, effect sizes depend on who is doing the intervention. They are typically more effective when implemented by a researcher, rather than a teacher (Lonigan 2006; Mol et al. 2009). Third, the number and the duration of sessions/week as well as the size of the groups need to be considered (Pavelko 2010). Fourth, the duration of the intervention varies from one study to another (from 4 weeks to a whole school year). Finally, in most of the studies, the language level of the children was measured before the intervention (i.e., Chlapana and Tafa 2014; Coyne et al. 2004; Justice et al. 2005a, b, c). Although children are usually distributed according to their language level for the intervention, this was not the case in this study. The control of all these variables would increase the effect sizes but at the cost of losing the natural condition of the interventions and thus the perspectives for generalization.

In our study, the school factor does not reach the significance threshold and explains a very small part of the variance, except for letter knowledge (5.4% of the variance). For this variable, there are significant differences between schools only in the CG, and they seem to be related to the priority given by the school to specific teaching targets (i.e., learning letters in kindergarten). Other possible explanations are the reading model, the teachers' beliefs, and the teachers' reading styles. These can have an impact on the motivation and engagement of children during reading sessions (Applegate and Applegate 2004; Greene Brabham and Lynch-Brown 2002; Strasser et al. 2013). Regarding the TG, we do not observe a significant difference in the children's language levels between schools. This could be explained by the instructional support. It involves homogenizing practices and maximizes the effects of the IR thanks to the recommended research-based methods (Lane and Wright 2007).

Some limitations due to the natural/ecological condition of the intervention can be pointed out. First, the training of the teachers was very short due to the organizational and time constraints of the schools. However, teacher training should be a priority (Charron et al. 2014). In fact, although the number of years of experience of the teachers is relatively high in our study (approximately 10 years), they did not have much training related to the connections between oral and written language or concerning the difficulties of specific populations (low SES and/or difficulties in language acquisition). The written explanations might have been misunderstood or not used in a homogeneous way by the teachers. Second, in most of the studies, books used during the interventions and targets are the same (for example, Sénéchal and Cornell 1993). In contrast, our intervention aimed to be natural by letting the teachers choose their own books and their own targets. This is how teachers can transmit the pleasure of reading and best adapt themselves to the level of their students. We aimed at staying as close as possible to a natural situation that can be easily reproduced in the future (for an important external validity), in which teachers can experiment with the IR for themselves, as well as take pleasure and strengthen their feelings of competence and efficiency. Nevertheless, it involves low control over the chosen objectives.

Given this free choice of books, the measurements were not specific to the books used during the intervention. For this reason, some more specific experiences (i.e., vocabulary, story grammar, links with classroom experiences) which could have been stimulated by the IR session cannot be measured.

Although our results support causal attributions regarding the effects of the intervention, the analyses of the mediating processes extend beyond the quasi-experimental design. Our analyses do not clearly establish the effects of

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the mediating variables (e.g. teacher effect) and therefore cannot conclude on a clear and direct causal relationship. Similarly, although our two groups seem similar in the pre-intervention phase, the TG had more children than the CG and unmeasured biases cannot be definitively precluded. Taking this into account, further replication within other schools with different characteristics (e.g., ethnicity, age, socioeconomic status of the children) is recommended.

Conclusion

This study is a first step towards applying IR to an ecological context, where the intervention was conducted within the classroom, with all the pupils and their regular teacher. It highlights the efficiency of IR for kindergarten children raised in a low SES family and school environment as well as from mixed language communities. Ten weeks of IR intervention allowed the children of the TG to significantly improve several linguistic (vocabulary and morphosyntax) and emergent literacy skills (print awareness, print knowledge and phonological awareness). Kindergarten curricula should provide clear guidelines for storybook reading to teachers.

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