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Crossing barriers: Profiles of reading and comprehension skills in early and late bilinguals, poor comprehenders, reading impaired, and typically developing children

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ABSTRACT

The aim of the present study was to analyze the performance of primary school children with different cognitive (specific learning disorders and poor comprehenders) or language (early and late bilinguals) profiles, considering reading and comprehension skills. In particular, it focused on a transparent orthography (Italian), complementing existing studies conducted mainly on children during their acquisition of an opaque orthography such as English, either as a first or second language. Five groups of children (N = 600) were involved in the study: children diagnosed with specific learning disorders, poor comprehenders, early bilinguals, late bilinguals, and a control group. They were tested for reading speed and accuracy of words, non-words, and text, and for reading and language comprehension when using the battery for Assessment of Reading and Comprehension in Developmental Age (Bonifacci, Tobia, Lami, & Snowling, 2014). Mean group differences and profiles within each group were analyzed. The comparison of different groups evidences how, within each dimension, there might be similar profiles across different groups (e.g., the same reading comprehension skills in early bilinguals, late bilinguals, and children with specific learning disorders) and highly discrepant skills within the same group (e.g., word and non-word reading in late bilinguals). These results provide some insight into the importance of assessing a complete functional profile aside from categorical classifications and reinforce the concept of dimensional models in developing trajectories of reading and comprehension skills (Snowling & Hulme, 2012).

1. Introduction

In the present study, children with specific reading impairments or reading comprehension difficulties were compared with children with a bilingual profile (early and late bilinguals speaking minority languages) and typically developing monolingual children through a multi-component assessment of reading performance. A number of studies have shown that, as far as many aspects are concerned, learning to read in a second language is similar to learning to read in a first language [see August and Shanahan (2006) and Genesee and Jared (2008) for comprehensive reviews]. On the other hand, reading development strongly builds on oral language proficiency, thus second-language speaking children may experience some gaps compared to their monolingual peers (Bedore & Peña, 2008), and different predictors or protective factors might be involved in literacy acquisition. Following these considerations, it is important to conduct multi-group comparison studies that allow for an investigation into how bilingual performance is placed regarding both typical and atypical learning profiles. While the bulk of research on bilingualism was conducted with children who were acquiring English as a second language (English language learners, ELL), a paucity of research is available on children from different linguistic backgrounds who are acquiring transparent languages (Florit & Cain, 2011); for Italian see Bellocchi, Bonifacci, and Burani (2014) and Tobia and Bonifacci (2015). The present study focused on a highly transparent language (Italian), with the aim of better refining and increasing knowledge from the few multiple group comparison studies mainly conducted on children with English as first (L1) or second language (L2). A profile analysis was included in order to assess the effective percentage of children with typical, borderline, or deficient performances and thus add information on functional characteristics to the group mean trends. Thus, the present study should provide a test of theoretical models of reading difficulty (Snow, Burns, & Griffin, 1998) that argue that within a dimensional model of reading skills, there are different profiles for students with reading difficulties.

1.1. Reading and comprehension in children with specific learning disorders

Efficient readers are expected to show adequate word reading speed and accuracy but also to comprehend the meanings of the words that they read. According to the Simple View of Reading (Gough & Tunmer,

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1986; Hoover & Gough, 1990), reading comprehension can be considered the product of decoding and language comprehension skills.

Considering the classification theorized in the Simple View of Reading (SVR) model, impairment in the decoding component paired with adequate language comprehension skills is typically referred to as a specific reading disorder (or dyslexia) (e.g., Vellutino, Fletcher, Snowling, & Scanlon, 2004). The opposite pattern of difficulties—good decoding skills and poor oral comprehension—characterizes poor comprehenders (PC) (e.g., Nation & Snowling, 1998a; Yuill & Oakhill, 1991). The Specific Learning Disorders (315.00) classification of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5; American Psychiatric Association, 2013) includes decoding and reading fluency disorders, spelling disorders as well as reading comprehension difficulties. Whereas decoding problems are linked to poor phonological skills (e.g., Frith, 1997; Landerl et al., 2013; Ramus, 2003), the source of difficulties in reading comprehension has been linked to poor semantic knowledge, poor morpho-syntactic and pragmatic skills, difficulties in making inferences and scarce use of meta-cognitive strategies (for a review see Nation, 2005). The prevalence of dyslexia highly depends on the language structure and writing system. If in English-speaking countries, the prevalence of dyslexia is estimated to be between 5 and 15% (Vellutino et al., 2004), the prevalence of dyslexia in the Italian population, with a highly transparent orthography, appears to be significantly lower; it has been estimated at 3.1%–3.2% (Barbiero et al., 2012), and that of reading comprehension impairments has been estimated to be approximately 3.5% (Cornoldi, De Beni, & Pazzaglia, 1996).

As supported by the SVR, there is a reciprocal interaction between decoding and comprehension impairments (Snowling & Hulme, 2012). Children with very poor decoding might ultimately also show difficulties in reading comprehension (but, theoretically, not in oral comprehension), because of their inaccurate and slow word reading (Gough & Tunmer, 1986; Perfetti, 1985). In turn, difficulties in language comprehension might ultimately impact decoding efficiency (despite adequate phonological skills). For example, poor vocabulary size might influence reading accuracy, leading to reading errors with low-frequency words or unknown irregular words (Nation & Snowling, 1998b).

In summary, specific learning disorders (SLD) involving decoding skills and poor comprehenders (PC) are distinct but interacting profiles. One of the aims of the present study was to investigate thoroughly, in a transparent orthography, which components of comprehension could be affected by decoding impairment and how oral comprehension impairment could affect decoding and reading comprehension skills.

1.2. Reading and comprehension in bilingual or second-language children

In western countries the number of children who are exposed to a reading system in a language that is different from their L1 is increasing and in most cases this is due to the intensification of migratory processes. Frequently these are second-generation children, who were born or arrived in their first years of life in the country where they are schooled: for example, in Italy 84% of non-Italian citizens in preschool programs and 64% of those in primary schools were born in Italy (MIUR, 2014). Children who are exposed to two or more languages can be defined as bilingual children, second language (L2) learners or dual-language children (Paradis, Genesee, & Crago, 2011): depending on the type of linguistic exposure they have received, many different definitions are used in literature. Kovelman, Baker, and Petitto (2008) distinguished between early bilinguals (EBs) and late bilinguals (LBs) based on the criteria of age of first bilingual exposure (lower or higher than the age of 3–4), which refers to when a bilingual child first begins to receive intensive, regular, and continued exposure to his/her new language. This distinction is supported by studies that highlighted how children who are exposed to L2 after the age of 4 (late bilinguals), that is, after they have already mastered linguistic competence in L1, do not show a native-like pattern of activity in L2 (Jasinska & Petitto, 2013; Perani et al., 2003; Weber-Fox & Neville, 1999). Although it is assumed that second language learners who are exposed to an L2 later in life may also reach monolingual-like linguistic proficiency (e.g., Bialystok & Hakuta, 1999; Johnson & Newport, 1989), only those exposed before the age of 4 (early bilinguals) should exhibit a monolingual-like linguistic processing in L2. In the present study, two groups of early and late bilinguals were compared for their decoding and text (reading and oral) comprehension skills. The rationale for including early and late bilinguals is that early bilinguals are more likely than late bilinguals to invoke the same learning strategies as monolinguals and therefore to exhibit the same reading profile as monolinguals; in contrast, late bilinguals, having first mastered competencies in their L1, may show different neural and cognitive mechanisms in acquiring an L2 compared with early bilinguals and monolinguals.

With reference to decoding ability and oral and reading comprehension skills, some studies showed evidence of similar patterns in L1 and L2 learning paths in early and simultaneous bilingual children (see Genesee & Jared, 2008) and a high degree of sensitivity to the systematic linguistic properties of their L2 (Bellocchi et al., 2014). Despite evidence that underlines that bilingualism is not a risk factor for impaired language development, many children, particularly late bilinguals, are likely to score in the at-risk range on linguistic measures in their weaker language (Bedore & Peña, 2008). Contrasting results are reported in the literature on this issue, and most studies have been conducted on opaque languages such as English. Some North American studies (Lesaux, Lipka, & Siegel, 2006; Lesaux, Rupp, & Siegel, 2007) have reported that ELLs are not necessarily ultimately PCs (approximately 74% were found to be good comprehenders in grade 4), and they found that in a sample of ELLs, it was possible to classify the readers based on the SVR model (good comprehenders, poor comprehenders, poor readers). Along this line, Geva and Massey-Garrison (2013) observed that at Grade 5, ELLs and monolingual peers did not differ from each other in English syntax and oral comprehension.

In contrast, other studies have reported poorer reading comprehension in bilingual populations. As outlined by August and Shanahan (2006), difficulties in L2 readers are linked to language proficiency and are more prevalent in reading comprehension than in decoding skills. Along this line, Kovelman et al. (2008) found that early bilinguals showed monolingual-like performance on decoding tasks, and both early and late bilinguals performed more poorly than did monolingual children on reading comprehension tasks. Recent meta-analyses (Jeon & Yamashita, 2014; Melby-Lervåg & Lervåg, 2013) offer similar evidence to that found by August and Shanahan (2006) that suggests that differences in reading comprehension between bilingual and monolingual children appear to be best explained by linguistic comprehension rather than decoding skills. There is, however, a paucity of research that compares early and late bilinguals with both typically developing readers and struggling readers, such as children with dyslexia or poor comprehenders.

1.3. Issues in the assessment of reading and comprehension skills

1.3.1. Orthographic transparency

Considering that reading processes are related to orthographic transparency, variations linked to the characteristics of the orthography can be observed in developing trajectories of reading abilities (Seymour, 2005; Seymour, Aro, & Erskine, 2003) and in well-known cognitive mechanisms underlying reading acquisition in typical and atypical development (e.g., Landerl et al., 2013; Moll et al., 2014; see Tobia & Marzocchi, 2014a, 2014b for the Italian orthography); therefore, reading models developed and tested on a single language could be misleading (Share, 2008) and it is important to extend the observations to children learning orthographies with various degrees of transparency. For example, it has been shown that the role of the single components of the Simple View of Reading, that is decoding and language comprehension, in predicting reading comprehension, changes in relation to the orthography transparency. In opaque orthographies such as English, decoding is the strongest predictor of reading comprehension in the early stages of learning or for individuals with poor decoding abilities, whereas oral comprehension skills are better predictors in participants who have more advanced skills in reading (Florit & Cain, 2011); in a transparent orthography such as Italian, oral comprehension was shown to be the best predictor of reading comprehension from the first grade, whereas reading accuracy played a significant but minor role (Tobia & Bonifacci, 2015). Furthermore, in transparent orthographies reading impairment is better reflected by reading speed than by reading accuracy. This is due to the fact that the high grapheme–phoneme consistency is achieved faster (Cossu, Gugliotta, & Marshall, 1995) and allows good levels of accuracy to be reached, even in children with reading impairments (Barca, Burani, Di Filippo, & Zoccolotti, 2006; Tressoldi, Stella, & Faggella, 2001), whereas reading speed had been shown to be highly resistant to treatment and remains the most stable marker in dyslexic adults (Pizzoli, Lami, Palmieri, & Solimando, 2011). Moreover, considering cognitive underpinnings of reading speed and accuracy, the role of phonological skills and rapid automatized naming, for example, is modulated by the orthography's transparency (e.g., Moll et al., 2014). A language with a relatively simple orthographic representation of the phonological structure, such as Italian, could offer an alternative and interesting perspective for the investigation of reading processes in multiple groups.

1.3.2. Text and question characteristics

Reading comprehension could also depend on text or question characteristics. Considering the first variable, it is possible to distinguish, for example, between narrative and descriptive passages. A few studies have analyzed comprehension differences between these types of texts, which may demand different cognitive skills (Eason, Goldberg, Young, Geist, & Cutting, 2012), and it has been suggested that narrative texts might be easier than descriptive ones in terms of comprehension scores (Diakidoy, Stylianou, Karefillidou, & Papageorgiou, 2005; Yildirim, Yildiz, Ates, & Rasinski, 2010).

Considering the nature of the questions used, two distinct elements could affect comprehension performance. First, questions can be formulated differently, for example, open and closed, true/false, multiple choice, and they may demand different levels of comprehension (Keenan, Betjemann, & Olson, 2008). According to Kintsch and Rawson (2005), there is a text-based level of comprehension, or local comprehension, which refers to the elaboration of explicitly given information and primarily involves lexical access and local coherence. However, comprehension processes also work on a situational level, i.e., global comprehension, which involves activating elaborative inferences and retrieving prior knowledge. This classification was demonstrated to be consistent in a sample of primary school students (Tobia, Ciancaleoni & Bonifacci, in press).

1.3.3. Importance of profile analysis

The analysis of each child's reading profile is an approach that aims to go beyond the information derived from groups' mean scores, for a qualitative understanding of the composition of groups, and with the final aim of better comprehending the differences between them. The use of profile analysis makes it possible to identify how many children within a group effectively show a weakness in a particular skill, and therefore clarify whether, beyond mean scores, a specific group of children (e.g., late bilinguals) is at risk for developing reading or language deficits. The main aim of profile analysis is to guide clinical work, giving indications on what weaknesses and strengths we can plausibly find in a specific subgroup of children.

1.4. Rationale of the study

The main issues that were addressed by this study were as follows:

1) Analyze group differences considering:
   - a- Reading and oral comprehension. The ability to answer open questions related to brief texts presented in written or oral form was tested; additionally, group differences based on the type of text (narrative versus descriptive) and the type of questions asked (local versus global) were investigated.
   - b- Reading proficiency. We investigated group differences in reading words, non-words, and passages, considering measures of both reading speed and accuracy.

2) Profile analysis: within each group, the effective percentage of children with typical, borderline, or deficient performance was analyzed, considering word, non-word and passage reading proficiency and oral and reading comprehension.

Globally, based on the reviewed literature, some specific patterns of results were expected:

- Among children with SLDs we expected to find, based on the literature and the criteria that define the diagnosis itself, poor decoding but adequate oral comprehension skills. We also expected reading comprehension to be worse than oral comprehension.
- Among PCs, we expected difficulties in oral comprehension (given that they are defined by this criterion), and we expected a significant proportion of children to fail in reading comprehension as well, in line with previous research. Regarding decoding skills, we expected adequate non-word reading skills but poorer word reading and passage reading accuracy.
- Finally, among early and late bilinguals, we expected globally better performance in children in the first group and better decoding skills than comprehension skills, in line with previous research. We expected the performance of early/late bilinguals to be significantly different for that of either clinical or typically developing monolingual groups. Specifically, we considered that EBs and LBs might have delayed rather than impaired decoding and comprehension skills, we expected them to have better decoding skills compared with the dyslexic group and better reading and oral comprehension skills compared with the PC group.
- Considering the peculiarity of Italian language, compared to studies conducted on opaque languages, we expected that group differences (e.g., between dyslexic and typically developing children) should be more marked concerning the speed parameter than the accuracy parameter of reading. On the contrary, in the oral comprehension tasks the role of orthography transparency should not influence the pattern of results found in English speaking populations, since the processing of oral linguistic competencies share similar basic skills that are independent from orthography.

The aim of the present study was therefore to analyze the performance of Italian primary school children with different cognitive (SLD and PC) and language (early and late bilinguals) profiles, considering their word/non-word decoding, passage reading speed and accuracy and reading and oral comprehension skills, in order to examine whether the reading performance of these groups differed, and if so, in what ways. A standardized battery of tests for assessing reading and comprehension by developmental age (ALCE; Bonifacci, Tobia, Lami, & Snowling, 2014) was used, which allows for evaluating decoding skills, reading speed and accuracy for words, non-words and passages, reading comprehension and oral comprehension in children from first to fifth grade. The inclusion of multiple components of reading skills through a unified battery was meant to allow for group comparisons within a multi-component model of reading skills.

2. Method

2.1. Participants

Six hundred participants (51.2% female; mean age = 8.87, SD = 1.48, range 6.06–12.50 years) were selected from a community sample of 1983 primary school students in grades 1 through 5. The sample comprised five groups of children, who were recruited within the same school classes and therefore matched for area of residence: children diagnosed with specific learning disorders (SLDs), poor comprehenders (PCs), early bilinguals (EBs), late bilinguals (LBs), and a control group (CG). Table 1 reports the distribution of participants across groups and grades.

The group of children with a Specific Learning Disorder comprised 30 Italian monolingual children (30% female; mean age = 9.95, SD = .76, range 8.44–11.18 years) with impaired decoding skills (word/non-word reading speed and/or accuracy) who received a formal diagnosis of a specific reading disorder (n = 10), specific spelling disorder (n = 4), or mixed disorder of scholastic skills (n = 16). The diagnoses were made in agreement with the criteria given by the International Classification of Diseases version 10 (World Health Organization, 1992): IQs within normal limits, absence of sensory deficits or emotional disorders, and age-appropriate education. Because the diagnosis of SLD in Italy cannot be made before the end of grade 2, the participants in this group were in grades 3 to 5.

The 129 PC participants (51.2% female; mean age = 8.97, SD = 1.44, range 6.06–11.79 years) were native Italian speakers who were selected based on their performance on the study's oral comprehension task (see Section 2.2). In addition, this group of children had typical non-word reading skills. Therefore, the criteria for the PC group were poor oral comprehension and good non-word decoding skills: only children with a T-score ≤ 35 in the oral comprehension task and a score ≥ 36 on the non-word reading task were included. The PC group included only monolingual children.

Children in the EB and LB groups were selected using Kovelman et al.'s (2008) (see also Bellocchi et al. (2014) and Jasinska & Petitto (2013)) criteria: to be part of the EB group, children had to be born in Italy and be exposed to an L1 other from Italian (L2) within the family context from birth and to the Italian language through extensive scholastic exposure (nursery or kindergarten) from birth or within the first four years of age. In contrast, criteria for including children in the LB group were: not having been born in Italy, exposure to an L1 other from Italian (L2) within the family context from birth and having their first continuative experience with Italian after 4 years of age. The information was collected from schoolteachers. None of the children in the EB and LB groups was diagnosed with Specific Learning Disorders.

There were 103 children classified as EBs (46.6% female; mean age = 8.72, SD = 1.40, range 6.37–12.50 years). The parents' languages were Arabic (28.2%), Spanish (15.5%), Albanian (10.7%), Bengali (5.8%), Urdu (4.9%), Romanian/Moldovan (2.9%), Tagalog (1%), and other (31.1%).

The LB group comprised 38 children (60.5% female) who had arrived in Italy from 8 to 1 year(s) before the testing time (mean age = 9.57, SD = 1.62, range 6.19–12.10 years). The native language groups were Urdu (31.6%), Romanian/Moldovan (15.8%), Bengali (10.5%), Arabic (7.9%), Spanish (7.9%), Tagalog (5.3%), Albanian (5.3%), and other (15.8%).

Finally, the CG comprised 300 Italian native speakers (53.7% female; mean age = 8.69, SD = 1.50, range 6.11–12.22 years) with sufficient performance (T-scores ≥ 36) on the following variables from the ALCE battery: non-word reading speed and accuracy, and oral comprehension. For each child in the SLD, PC, EB, and LB groups, a child of the same gender and from the same school and, where possible, same classroom, was selected for the CG.

A chi-square test indicated that the groups were balanced by gender ($\chi^2(4) = 8.321$, $p = .08$), with the exception of the SLD group, in which the number of boys was significantly higher than the number of girls (adjusted standardized residuals >2). The chi-square test performed on school grades was significant ($\chi^2(16) = 36.949$, $p < .01$). This result depended on the SLD group, which included only children from grades 3 to 5 (see Table 1).

Table 1
Distribution of the sample across different grades.

Group	Grade 1	2	3	4	5	Total
SLD	0	0	6	10	14	30
PC	20	24	25	27	33	129
EB	18	27	23	17	18	103
LB	5	4	8	9	12	38
CG	70	61	49	59	61	300
Tot	113	116	111	122	138	600

2.2. Material

The ALCE battery (Bonifacci et al., 2014) is a standardized battery that evaluates decoding skills and reading and oral comprehension in children from first to fifth grade.

The instrument includes the following tasks, and T-scores were obtained for each measure, based on the Italian national norms by grade level that were given in the test's manual (Bonifacci et al., 2014).

2.2.1. Word reading

A total of 60 words, increasing in length and decreasing in frequency (Burani, Barca, & Saskia Arduino, 2001), were presented in 3 lists of 20 words each, with a total time limit of 120 s. Reading speed was measured in syllables per second (syll/s, calculated by dividing the total number of syllables read by the number of seconds it took to read them), and the percentage of errors was calculated on the total number of words the children read in the time limit. A maximum of one error per word was counted. For example, if a child reads 50 of the 60 words in 120 s, 45 of which were read correctly, the error percentage corresponded to 10%. The KR-20 index, measured to analyze the task's reliability, was 0.89.

2.2.2. Non-word reading

Two lists of 15 non-words (from two to four syllables and conforming to the rules of Italian orthography) each were administered to each child. The time limit for the 2 lists was 60 s. Reading speed (syll/s) and percentage of errors on the total number of words read were calculated with the same procedures used for the word reading task. The KR-20 index for this task was 0.96.

2.2.3. Passage reading

Children were asked to read aloud two passages (described in the following paragraph); they were told that some comprehension questions would follow. For each passage, reading speed measured in syllables per second (syll/s) and total number of errors were recorded.

2.2.4. Reading comprehension

Two passages, one descriptive and one narrative, were provided for each grade. Children were asked to respond to 10 comprehension questions that required open answers on the passages they read aloud. Texts remained available for consultation, and the children were instructed that they could look back at information within the written passages. Five of the questions required text-based comprehension processes, referring to information that was explicitly presented in the passages (local comprehension), the other five questions required inferential reasoning (global comprehension) (Kintsch & Rawson, 2005). An example of a global comprehension question is: “Why did Gianni say he found a treasure?”, which was referred to in the text as:

"Often Gianni wants to show that he is the strongest and the bravest and to be admired by everyone. [He then pretends to find a treasure]". For each question, a score of 0, 1, or 2 was given following fixed criteria. Total scores ranged from 0 to 20 for each passage, and local and global comprehension scores ranged from 0 to 10 for each passage. Reading comprehension reliability was measured using Cronbach's alpha (from 0.74 to 0.83) separate for each grade.

2.2.5. Oral comprehension

Participants listened to a narrative passage that was read aloud by the examiner, and then they were asked to answer 10 comprehension questions; they were not allowed to look at the text, either when it was presented or when they were asked to respond to the questions. One narrative passage for each grade was provided; the types of questions and scoring were the same as for the reading comprehension task. Total scores ranged from 0 to 20, and, also in this case, local and global comprehension scores were obtained. Cronbach's alphas measured for each grade showed coefficients from 0.68 to 0.80.

There were a total of 15 passages, 3 for each grade (2 for passage reading plus comprehension and one for oral comprehension), characterized by increasing readability complexity from grades 1 to 5 measured by the DylanBase index (Dell'Orletta, Montemagni, & Venturi, 2011).

2.3. Procedure

Informed consent for participating in the study was signed by parents. The tasks were administered individually by trained psychologists in a quiet room at the children's school. The testing session lasted 25–50 min, based on children's ages and skills. The task order was balanced across participants. Pauses were allowed if the child showed signs of fatigue.

3. Results

Descriptive statistics with means, SDs and T-scores for each task and each group are presented in Table 2. Differences were analyzed and interpreted according to the specific analyses described as follows.

In order to investigate the first aim of the study, ANOVAs were performed. The first one used a $2 \times 2 \times 5$ model with type of question (local versus global) and type of text (narrative versus descriptive) as within-subject factors, group (SLD, PC, EB, LB, CG) as a between-subject factor and T-scores on reading comprehension as the dependent variable. No significant multivariate effects on the within-participant factors or interactions with group emerged. The between-group factor showed a significant effect: $F(4586) = 36.881$, $p < .001$, $\eta^2 = 0.20$. Homogenous subsets resulting from Tukey's post hoc tests are presented in Fig. 2(panel 4a). It emerged that PCs were significantly poorer than the other groups in reading comprehension and that the CG, EB and SLD groups have the best performance; the LBs were significantly worse than the CG but not significantly different from the SLDs and EBs.

In the second analysis, differences in oral comprehension were analyzed in a 2×5 design using type of question (local versus global) as a within-subject factor and group (SLD, PC, EB, LB, CG) as a between-subject factor. T-scores in oral comprehension constituted the dependent variable. No multivariate effects for the within-participant factors or the interaction with group were found, but a significant effect of group emerged: $F(4595) = 186.314$, $p < .001$, $\eta^2 = 0.56$. Tukey's post hoc test results are graphically presented in Fig. 2(panel 4b). The PC group presented the worst performance in oral comprehension, also because of the selection criteria for this group. Then, the LB group showed significantly better scores than the PCs but also significantly worse than the other three groups, which showed similar oral comprehension skills.

The third analysis of reading speed/accuracy scores was run in a $3 \times 2 \times 5$ design with material (words, non-words, text) and measure (reading speed versus reading accuracy) as the within-subject factors and group (SLD, PC, EB, LB, CG) as a between-subject factor. T-scores for the reading tasks were the dependent variables. A significant multivariate effect of material (Pillai's Trace = 0.097, $F(2589) = 31.550$, $p < .001$, $\eta^2 = 0.10$) and measure (Pillai's Trace = 0.006, $F(1590) = 3.821$, $p = 0.05$, $\eta^2 = 0.01$) emerged. In particular, pairwise comparisons with Bonferroni correction showed that T-scores for the non-word-reading task were globally higher than those for both word ($p < .001$) and passage reading ($p < .001$), and the word reading scores were higher than those for passage reading ($p < .001$). Considering the measure used to evaluate reading performance, the accuracy scores were higher than those for speed ($p = .05$). Furthermore, the material × measure × group interaction was significant (Pillai's Trace = .040, $F(8,1180) = 3.006$, $p < .01$, $\eta^2 = .02$). Repeated measures t-tests were used to analyze interaction effects (Fig. 1).

These analyses revealed significant differences among reading materials (words, non-words and texts) for the PC, EB and LB groups. In particular, the PC group had significantly better performance in

Table 2
Descriptives: mean (standard deviation).

		Groups				
		SLD	PC	EB	LB	CG
Reading comprehension	Narrative passage – local	45.54 (11.70)	41.48 (10.90)	46.10 (10.76)	48.15 (11.46)	50.28 (8.83)
	Narrative passage –– global	47.32 (9.69)	39.81 (10.27)	47.12 (9.56)	46.74 (11.36)	50.33 (9.22)
	Narrative passage total	45.77 (9.93)	38.97 (10.81)	46.12 (9.86)	46.08 (11.96)	50.37 (8.68)
	Descriptive passage – local	46.56 (9.72)	41.41 (11.34)	48.07 (10.18)	44.65 (10.94)	50.13 (9.5)
	Descriptive passage – global	47.60 (11.03)	40.52 (10.14)	48.81 (10.86)	44.15 (11.65)	50.54 (9.96)
	Descriptive passage total	46.61 (11.09)	39.43 (10.96)	48.25 (10.31)	43.44 (11.88)	50.41 (9.68)
	Reading comprehension total	45.89 (10.25)	37.83 (10.53)	46.80 (10.28)	43.97 (12.05)	50.39 (9.01)
Oral comprehension	Oral passage – local	49.46 (9.11)	31.53 (6.52)	48.29 (10.64)	44.42 (12.22)	51.27 (7.86)
	Oral passage – global	51.25 (8.88)	32.24 (5.33)	48.23 (9.85)	42.83 (11.48)	51.58 (8.05)
	Oral passage total	50.00 (8.17)	29.54 (4.30)	48.15 (9.88)	44.14 (11.48)	51.65 (7.52)
Decoding	Words speed	36.25 (7.98)	47.52 (8.31)	47.64 (9.76)	42.57 (9.76)	52.30 (9.05)
	Words accuracy	40.93 (9.62)	48.07 (9.11)	49.11 (9.36)	46.52 (10.68)	49.96 (7.84)
	Non-words speed	36.68 (5.24)	49.60 (8.96)	51.37 (11.42)	47.49 (10.80)	51.67 (9.14)
	Non-words accuracy	39.32 (6.91)	48.89 (7.63)	49.70 (10.43)	48.95 (8.36)	50.90 (8.10)
	Passage speed	34.95 (7.87)	46.31 (8.31)	45.67 (8.99)	42.35 (9.58)	52.26 (9.22)
	Passage accuracy	38.32 (9.61)	45.22 (8.30)	47.61 (9.18)	44.64 (9.20)	50.59 (8.15)

SLD = specific learning disorder.
PC = poor comprehenders.
EB = early bilinguals.
LB = late bilinguals.
CG = control group.

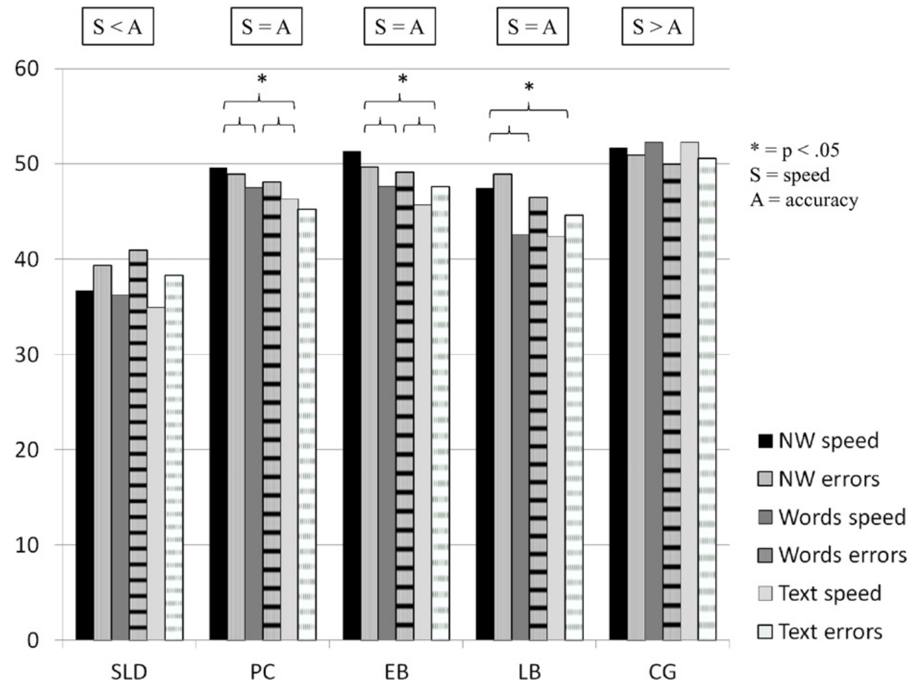

Fig. 1. Results of the repeated measure ANOVA on the reading (decoding) performance task. * = $p < .05$; S = speed; A = accuracy.

non-word reading than for both words and texts, and passage reading was significantly the most difficult reading task for the PCs; the same pattern was found for the EBs. LBs also showed a difference between reading materials: in their case, non-word decoding performance was better than that for both words and passage reading, which showed similar T-scores. These three groups (PC, EB, and LB) showed no discrepancies between accuracy and speed T-scores. In contrast, the children with SLDs and the CG did showed this discrepancy: SLDs were associated with lower T-scores for decoding speed compared with decoding accuracy, whereas the CG was significantly faster than accurate in decoding.

Finally, a main effect of group was identified ($F(4590) = 35.665$, $p < .001$, $\eta^2 = 0.19$). A MANOVA was run to analyze group differences in all of the decoding parameters (accuracy and speed for words, non-word and passage reading). Main effects of group were found for all of the variables considered ($p < .001$); results from Tukey's post hoc tests are presented in Fig. 2(panels 1–3).

The SLD group significantly underperformed the other groups in both speed and accuracy parameters for word, non-word and passage reading. It also emerged that the LB group had slower word reading speed compared with the EBs and PCs, who, in turn, were slower than the CG. No differences emerged between the LBs, PCs, EBs and CG in either word reading accuracy or non-word reading speed and accuracy, whereas in passage reading, the LB, PC and EB groups underperformed compared to the CG.

3.1. Profile analysis

To explore the second research question and determine the decoding and comprehension profiles of the groups of children in the present study, participants were classified as having deficient (T-score ≤ 35), borderline (T-score between 36 and 40), or typical performance (T-score ≥ 41) in the word, non-word and passage reading speed and accuracy, reading comprehension, and oral comprehension variables. The percentages of children for each group in either the deficient, borderline, or typical range for these tasks were then calculated. With a nonparametric chi-square analysis, the frequency distribution of the three categories of performance for each group, considering each variable separately, was compared with the theoretical normal distribution: 7% of cases with a T-score of 35 or lower (corresponding to −1.5 SD), an additional 9% of cases with a T-score between 36 and 40 (between −1.5 and −1 SD), and 84% of cases with T-scores higher than 40.

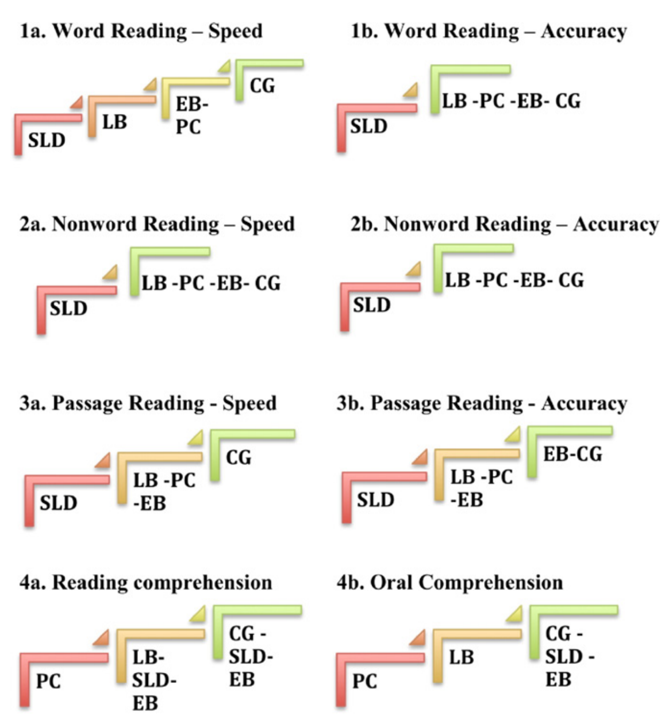

Fig. 2. Graphical staircase representation of Tukey's post-hoc homogenous subsets resulted from group difference analyses in all reading parameters (accuracy and speed for words, non words and passage reading) and comprehension tasks from the ALCE battery.

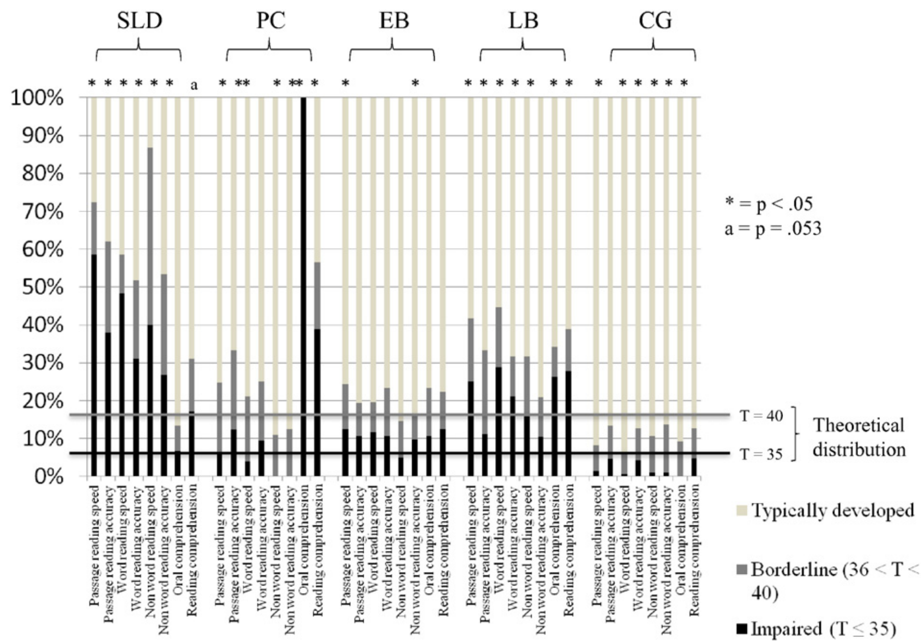

Fig. 3. Percentage of children falling in each performance category, with corresponding nonparametric chi-square test. * = $p < .05$; a = p = .053.

The percentages of children in each category, considering the five groups separately and considering the results of the nonparametric chi-square analysis, are presented in Fig. 3.

As shown in Fig. 3, the SLD group contained a higher than expected (based on the normal distribution) percentage of children with impaired and/or borderline reading speed and accuracy (for word, non-word and/or passage reading) and marginally impaired and/or borderline reading comprehension. For the PC group, a higher than expected number of children with impaired and/or borderline performance was observed in word and passage reading speed accuracy and also for reading and oral comprehension. The EB group had a higher percentage of children with impaired and/or borderline performance only for passage reading speed and non-word reading accuracy. In contrast, the LB group had a higher than expected percentage of children in the impaired and/or borderline range on both oral and reading comprehension and in all measures of decoding, excluding accuracy in reading non-words. Finally, the CG had a higher than expected percentage of children with adequate performance in reading (with the exception of passage reading accuracy) and oral comprehension. This last result regarding oral comprehension is attributable, as with the PC group, to a bias that derived from the selection criteria.

4. Discussion

In the present study, we compared different profiles of reading performance (speed and accuracy for words, non-words and passages), oral comprehension (auditory presentation of a text followed by open-ended comprehension questions) and reading comprehension (reading a text aloud followed by open-ended comprehension questions) in children with SLDs, PCs, EBs and LBs, and children with typical development (CG). The aims were twofold: one, we wanted to compare the performance among different groups in a set of decoding and comprehension parameters, and two, we wanted to analyze individual differences within and across groups in order to evaluate the percentages of children who effectively fell below the average level. It emerged that, within each reading dimension, there might be similar profiles across different groups (e.g., the same reading comprehension skills in early bilinguals, late bilinguals, and children with SLDs) and highly discrepant skills within the same group (e.g., word and non-word reading in late bilinguals).

4.1. Differences among the investigated reading and comprehension components

In reading comprehension, the influence of the type of text (narrative vs. descriptive) and type of questions (local vs. global) was analyzed. The results showed no significant effects of within-participant factors or interactions; therefore, it appears that reading comprehension performance, in terms of answering open questions, is globally similar when involving either narrative or descriptive passages and local or global (inferential) questions. The facilitation found in past studies for comprehending narrative passages (e.g., Diakidoy et al., 2005) was not replicated in the present research, and the analysis of oral comprehension skills showed no multivariate effects for the within-participant factor (type of question, local vs. global) or its interaction with group. The present results suggest that impaired reading comprehension and oral comprehension are independent of type of text or the level of inferences requested.

Finally, decoding performance was analyzed. In particular, non-word reading, considered a pure measure of grapheme–phoneme conversion, had globally higher scores than both word and passage reading. Then, considering the parameter used to evaluate reading proficiency, accuracy scores were higher than speed scores. However, in the analysis of reading speed and accuracy, most of the within-participant factors and the interactions with group were significant.

4.2. Group differences

To clarify the complex pattern of the results that were observed, they are reorganized and discussed separately for each group of learners.

4.2.1. Children with specific learning disorders

As expected, children with SLDs had relatively low word, non-word and passage reading speed and accuracy scores, as was revealed by the three-way material × measure × group interaction (see Fig. 1). Post hoc analysis of the main factor group (Fig. 2, panels 1–3) showed that children with SLDs had the worst performance compared with the other groups, with mean scores between −1 and −1.5 SDs. The significant measure × group interaction revealed that the parameter of accuracy was better than speed for the SLDs, and the pattern was the opposite for children in the CG.

In reading comprehension tasks, children with SLDs showed better performance than the PC group, and Tukey's post hoc analysis showed that their performance was similar to that of the CG and not significantly different from that of the EB and LB groups (see Fig. 2, panel 4a). Mean reading comprehension scores fall in the normal range. In oral comprehension tasks, children with SLDs significantly outperformed the PC and LB groups and performed similarly to the EBs and the CG (Fig. 2, panel 4b).

In the SLD group, distribution across performance levels (typically developed, borderline, impaired) was similar to the theoretical one in oral comprehension skills, whereas more children than expected fell in the borderline and deficient ranges for word, non-word and passage reading speed and accuracy and, to a lesser extent, for reading comprehension. This pattern of results is highly predictable on the basis of theoretical models such as the Simple View of Reading (Gough & Tunmer, 1986). The fact that a higher than expected percentage showed borderline performance in reading comprehension suggests that decoding skills might significantly and negatively affect reading comprehension in children with SLDs, thus requiring appropriate clinical and education interventions. The data on decoding skills highlighted a primary deficit in reading speed, which is typical of reading impairment in transparent languages (Zoccolotti et al., 1999).

4.2.2. Poor comprehenders

Children in the PC group showed the worst performance compared with the other groups in both oral and reading comprehension (Fig. 2, panel 4a, b). In reading comprehension, their mean scores ranged between 1 and 1.5 SDs below the mean. In oral comprehension, they had a mean score approximately 2 SDs below the mean. This result is the consequence of the criteria used to select this group of participants (a T-score ≤ 35 for total oral comprehension scores), but these findings nevertheless confirm that the PC category is distinct from the dyslexic category.

With respect to reading accuracy and speed measures, the PCs showed better scores than the SLD group, but their performance, similar to that of the LB group, was significantly worse than the CG in word reading speed and passage reading speed and accuracy (Fig. 2, panel 1–3). The interaction of material × group showed significantly higher non-word reading scores for PCs; furthermore, their performance in word reading was better than that in passage reading, in which they showed the worst results.

The PC group showed a distribution that was significantly different from the predicted one in all the variables included in the analysis, except for word reading accuracy. With respect to word and passage reading speed, more children than expected were included in the borderline (but not deficient) category, and the number of children was higher than expected for both the borderline and deficient categories for passage reading accuracy and reading comprehension. Oral comprehension was the variable that was used to select the sample, and as such, it was impaired for the entire PC group. This pattern of results confirms previous investigations on the cognitive profile of poor comprehension (e.g., Bishop & Snowling, 2004), and it adds evidence for the pervasive difficulty in understanding written texts, independent of the type of text (narrative or descriptive) or the type of comprehension level being tested (local or global). The high percentage of PCs who were in the borderline range of passage decoding skills appears to be in line with their documented weaknesses in benefiting from contextual cues (Nation & Snowling, 1998a), which are assumed to speed up reading words within meaningful passages. A mirror profile was found for children with SLDs, who actually showed fully adequate oral comprehension skills, intermediate reading comprehension skills, and severely impaired decoding skills.

4.2.3. Early bilinguals

The performance of early bilinguals was very similar to that of the CG in most of the dimensions that were tested (non-word reading speed and accuracy, word reading speed, passage reading accuracy, and oral and reading comprehension) (Fig. 2), and their scores always fell in the normal range, although they were slightly lower than those found in the CG. Interestingly, the EBs outperformed the PCs on the oral and reading comprehension tasks and the SLDs for all decoding skills. Distribution across categories of the EB sample was similar to the theoretical one, with the exception of passage reading speed: there was a higher number of children with deficient and borderline performance than was expected. In non-word reading accuracy, there was a higher percentage of EB children in the deficient category, but fewer than expected were borderline; thus, non-word reading was not globally impaired in this group. Fig. 1 shows that their worst performance was in passage reading speed, and this could be explained as a possible effect of the acknowledged weaknesses in vocabulary amplitude (Bialystok, 2009), which might affect, although not in a pervasive way, the efficiency of the lexical route during passage reading.

4.2.4. Late bilinguals

Late bilinguals showed, in general, better performance than clinical groups (PCs and SLDs) and worse performance than the control group. In particular, their reading comprehension scores were higher than those of the PCs but weaker than those of the control group; they were not significantly different from the EB and SLD scores. Their performance in oral comprehension was better than that of the PC group but significantly worse than that for the other three groups. Finally, their decoding skills were better than those of the SLD group, similar to the other groups in word reading accuracy and non-word reading speed and accuracy and worst than the CG in passage reading speed and accuracy. Overall, all the scores were in the normal range.

Considering the percentage of children who fell in the typical, borderline or impaired range of scores, the group of LBs presented higher portions of children with difficulties in all the variables considered, except non-word reading accuracy. In particular, the portion of LBs with a deficient and a borderline performance was higher than expected for word and passage reading speed and accuracy, whereas the distribution was atypical only for the deficient category considering reading comprehension and oral comprehension. In an imaginary staircase with levels of performance (see Fig. 2), LBs are mostly situated on the second step, just above the clinically impaired groups, but below the other groups. The relatively worse performance of LBs compared to EBs could be explained by the fact that late bilinguals had less exposure to Italian and thus, presumably, had less linguistic proficiency than the EBs. However, what this paper adds to previous literature is that, despite their lower proficiency in Italian, the performance of LBs is better than that of the monolingual clinical groups; in particular, they showed better reading and oral comprehension skills than poor comprehenders and better decoding skills than children with SLD.

4.3. Conclusions

This study presents some limitations, specifically the paucity of measures of proficiency and SES information in the EB and LB groups, which may limit the generalizability of the results and which would be better accounted for in future cross-group comparisons. Nonetheless, it offers distinctive evidence about the comparison of different groups of learners in regarding the multiple processes that underlie word, non-word and passage reading and comprehension capacities, and it offers a profile analysis, which is very important in order to qualitatively understand differences between groups beyond the information derived from their mean scores. In contrast with other studies on multiple group comparisons, this study was conducted with a highly transparent language, Italian, thus adding an original contribution to the present literature. In line with other studies conducted on children learning English as an L2 (August & Shanahan, 2006), it emerged that bilingual children acquiring Italian also reached monolingual-like levels of word and non-word reading accuracy and non-word reading speed. Interestingly, in word reading speed both EBs and LBs underperformed compared to typical monolingual readers. Considering that for a transparent orthography the acquisition of grapheme–phoneme correspondence is achieved faster (Cossu et al., 1995), children exposed to Italian as an L2 can reach appropriate levels of decoding accuracy. However, when lexical retrieval (and therefore language proficiency) is also involved, such as in word reading tasks, children fail to be as fast as their monolingual peers, despite being accurate. This reinforces the idea that speed is a more sensitive parameter in transparent orthographies (Barca et al., 2006). In passage reading, where lexical and syntactical knowledge are involved, bilingual children showed a gap both in reading speed (EBs and LBs) and accuracy (LBs). To sum up, when learning a transparent orthography, it is easier to master grapheme–phoneme correspondence, but the major role of lexical and linguistic knowledge involved in reading may prevent bilinguals from being as fast as monolinguals in reading tasks. Considering comprehension, differently from Kovelman et al. (2008), early bilinguals showed similar levels of oral and reading comprehension compared to typically developing monolinguals, whereas late bilinguals showed a weaker performance despite not falling in the clinical range.

In sum, the present study gives some insight into the importance of assessing a complete functional profile separate from categorical classifications, and it reinforces the concept of dimensional models in developing trajectories of reading and comprehension skills (Snowling & Hulme, 2012). Moreover, the pattern of results observed suggested that there are many similarities to studies conducted on opaque languages such as English, thus allowing us to generalize primary predictions based on the SVR model. However, the study also outlined some specificities of transparent language, such as the major role of decoding speed over decoding accuracy.

These results, in turn, present important implications for clinical and educational settings. For example, it would be important to overcome a single group intervention program, but rather to develop an across-group perspective based on the pattern of strengths (e.g. oral comprehension in SLDs and EBs, non-word reading in EBs and LBs), and weaknesses (e.g. oral comprehension for PCs and LBs). On this subject, intervention programs that were found to be effective for PCs (Clarke, Snowling, Truelove, & Hulme, 2010; Clarke, Truelove, Hulme, & Snowling, 2013) may also be applied to LBs. Finally, this study reinforces the idea that bilingualism is a multifaceted phenomenon and that bilingual children show a different profile compared to clinical groups (PCs and SLDs). In summary, there are varied manifestations of decoding, reading and comprehension weaknesses or impairments (Elliott & Grigorenko, 2014) and, beyond categorical classifications, interventions and teaching should be programmed in order to primarily consider the strengths and difficulties in the child's reading profile.

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