Ampersand 12 (2024) 100166

Contents lists available at ScienceDirect

Ampersand

journal homepage: www.elsevier.com/locate/amper

The Daily Linguistic Practice Interview: A new instrument to assess language use and experience in minority language children and their effect on reading skills

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ARTICLE INFO

Keywords:
Bilingualism
Reading skills
Language experience
Minority language children

ABSTRACT

The increasing number of primary students with varying degrees of exposure to a family minority language requires a reflection on whether specific aspects of their daily language experience influence their learning. Indeed, Minority Language Children (MLC) often report difficulties in reading that must be better investigated to exclude neurodevelopmental conditions such as developmental dyslexia.

To this aim, we developed a new instrument, the *Daily Linguistic Practice Interview*. It allows for collecting information about the linguistic practice and use in the family (Scale A) and extra-family context (Scale B), and about the child's linguistic preferences and habits (Scale C). The Interview further provides analogic quantitative measures of minority language active speaking with mother, father, and passive listening, in the form of clocks to paint.

The relationship between these linguistic aspects and reading skills was investigated on 79 MLC aged 8 to 11 y. o.through a correlational approach and regression models. Our results show that family and extra-family language use influence accurate lexical recognition, moreover a "mother effect" broadly affects reading skills in the majority language.

Our findings suggest that MLC deserve a more careful evaluation of learning disorders with *ad hoc* standardized tests, that incorporates information about the family language exposure.

1. Introduction

In the last decades, the Italian educational system has faced a significant increase in the number of students speaking a minority language different from the language of education (e.g., Italian). A recent report (MIUR, 2020) indicates that the number of Minority Language Children (MLC) from a migrant background increased from 60,000 in 1997 to over 826,000 in 2020. Most of them can be regarded as second-generation immigrant children, i.e., children born in Italy to non-Italian parents. A recent report based on Italian students' academic achievements, indicates that MLC reach lower outcomes, with general lower-level attainments than their monolingual peers (Istituto Nazionale di Statistica [ISTAT], 2020). Data collected in the Italian context further reported generally low academic outcomes for this population (Azzolini

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https://doi.org/10.1016/j.amper.2024.100166
Received 9 November 2022; Received in revised form 23 August 2023; Accepted 29 January 2024
Available online 6 February 2024

et al., 2012; Barban and White, 2011; Murineddu et al., 2006), but it is still unclear whether they might be related to learning difficulties or to the differences in the linguistic background. Indeed, the lack of specific diagnostic criteria for learning disorders in MLC, usually bilinguals, at least to some extent, makes this issue very relevant. In the clinical context these children are often evaluated using tests standardized on monolinguals. This issue, recently addressed in the new "Italian guidelines for the identification of Specific Learning Disorder" (Recommendation 7),[2] is of great relevance if one considers that children who struggle with learning are at high risk for school dropouts (Gubbels et al., 2019). Previous studies considered the role played by various factors in affecting learning achievements and language development in multilingual students. For instance, the survey by Mussino and Strozza (2012) identified several possible factors causing learning problems and subsequently educational failures in such a population, among which the authors highlighted socioeconomic deprivation. Other studies observed that proficiency in the language of education supports the development of learning skills in MLC (cf., in primary school, Whiteside and Norbury, 2017). However, there is no consensus about how language proficiency in the minority language might moderate learning skills in the majority one. Accordingly, when studying the possible causes of learning difficulties in MLC, it becomes crucial to consider not only aspects related to the socioeconomic level but also the language use and experience in each language spoken by the student (Gullifer et al., 2021). To this aim, we developed a new instrument to collect information about the individual language exposure and social use in multilingual children (8–11 y.o.) exposed to Italian as the language of instruction. Information collected through our new instrument will be used to explore the relationship between language use and experience in both the minority and majority language and the reading outcomes in the majority one (i.e., Italian).

1.1. Minority language or heritage language speakers: searching for a definition

According to the literature, the term "language-minority" refers to "*individuals from homes where a language other than a societal language is actively used, who therefore have had an opportunity to develop some level of proficiency in a language other than a societal language*" (August and Shanahan, 2006, pp. 2). Heritage Language Speakers is an alternative way to refer to children who have acquired their minority language simultaneously with the majority one, or the minority language as a first language before the immigration has occurred (Benmamoun et al., 2013). Heritage language speakers, therefore, are speakers that might use a minority language in the home environment and that identify themselves in the minority culture, though showing a predominant use and exposure in the daily life context to the majority language (Kelleher et al., 2010; Polinsky and Kagan, 2007; Valdés, 2005). In the current study, we will refer to our participants as MLC considering this label as a broad and more inclusive term to refer to first- and second-generation immigrants who are daily exposed to at least two languages (the family one, and the majority one). Indeed, as their use and experience of the minority/majority language were rather heterogeneous, not all of them could be safely defined as Heritage Language speakers.

2. Factors that influence MLC's learning skills

As mentioned above, the learning profile of MLC is influenced by a range of factors. In the current section, we will focus on the role played by several variables related to the individual language experience in affecting the learning outcomes of this population. These variables are represented by (i) language exposure (regarded as the age of first exposure), (ii) amount of exposure to the majority language (regarded as the cumulative exposure), and (iii) quality of the language input.

2.1. The role of language exposure

There is consensus in the literature about the fact that the *age of first exposure* to a second (majority) language is a factor influencing the students' learning profile. For instance, a study by Kovelman et al. (2008) observed that reading proficiency in the majority language is related to the age of first exposure. More in detail, the authors tested two groups of bilingual children: Spanish MLC exposed to English since birth (defined as early bilinguals) and a group of MLC exposed after three years of age (late bilinguals). Early bilinguals showed a better performance in language and reading skills, such as phoneme segmentation and pseudowords reading in English, compared to late bilinguals. Interestingly, the performance of early bilinguals was comparable to that of their English monolingual peers.

A study conducted in Italian only partially replicated such a pattern of results (Bonifacci and Tobia, 2016). The authors compared the performance of different samples of primary school children on different academic skills. Experimental groups included: early and late bilinguals (exposed to the majority language after 4 years of age), a monolingual control group, a group of poor comprehenders, and children with specific learning disorders. Children with learning disorders underperformed other groups in all reading measures. Late bilinguals reported lower rates than early bilinguals in word reading speed; generally, all the bilingual participants were slower than controls in word reading fluency. Similarly, all bilinguals (early and late) were slower and less accurate in passage reading. No difference between bilinguals and controls emerged concerning word reading accuracy and non-word reading accuracy and fluency (Bonifacci and Tobia, 2016).

Overall, these findings suggest that the age of first exposure plays a role in verbal competence and some aspects of reading achievements, wherease reading acquisition started at the same age for monolingual and MLC. Indeed, as supported by a previous study by Murineddu et al. (2006), MLC, regardless of their age of first exposure, are less efficient in word reading accuracy and fluency, as well as in pseudoword reading fluency (in terms of syllables/sec.) than monolingual children.

In sum, although the age of first exposure is a relevant variable to consider, several studies (Bedore et al., 2012; Sorenson Duncan and Paradis, 2016; Grøver et al., 2018; Unsworth et al., 2018; Vender et al., 2016) suggest that this factor alone does not exhaustively explain the heterogeneity of the language and learning outcomes of MLC.

2.2. The role of cumulative language exposure

Since the length of exposure alone does not completely explain the variation in MLC learning outcomes, it seems necessary to consider the *amount of language exposure* and the quality and type of input received. This difference has been considered in the literature (Unsworth et al., 2018) as traditional vs cumulative language exposure.

As reported by Unsworth (2013) cumulative length of exposure is "a measure intended to capture the sum of bilingual children's language exposure over time and to facilitate more accurate comparisons between bilingual and monolingual language development" (p. 86). In this perspective, cumulative exposure might be considered as an articulated index including the real amount and length of exposure to language input (regardless of the time spent in the country of origin), and crucially the type of language used in a different social context, quality, and type of input.

In line with this idea, the Utrecht Bilingual Language Exposure Calculator (Unsworth, 2011a, 2011b) allows to calculate several indexes as (a) current amount of exposure to each language conceived as the percentage of the child's waking hours in a typical week; (b) cumulative length of exposure to each language in years; (c) traditional length of

[2] Linee Guida sulla Gestione dei Disturbi Specifici dell'Apprendimento, June 2021, published by the Italian National Guidelines System, Rome 20 January 2022. https://www.iss.it/documents/20126/8331678/LG-389-AIP_DSA

exposure to each language in years and (d) quality of the input the child has in each of the languages spoken. To calculate these indices the UBILEC investigates aspect as the amount of time each person living in the child's home spends talking the two languages with him, the amount of time the child spends at daycare/school, the amount of time the child spends on extra-curricular activities (namely sports and clubs, friends, watching TV, reading and using the computer, and so on). Interestingly both cumulative and current exposure to the minority language calculated through the UBILEC were found by Unsworth (2013) related to Dutch-English bilinguals' accuracy scores on definite determiners.

An Italian adaptation of the UBILEC has been used by Vender et al. (2016) in a study for investigating how bilingual children perform in some relevant markers of specific language mpairments like nonword repetition and clitics production. Information about the children's age of first exposure, their current quantity of exposure, the traditional length of exposure, and the cumulative length of exposure to the majority language were considered. In particular, the role that length of exposure and *cumulative* length of exposure played on language competence in three groups of early bilinguals (Romanian-speaking children, Albanian-speaking children, and Arabic-speaking children) with a fully comparable age of first exposure, was explored. When considering cumulative exposure, the Arabic-speaking group was characterized by a significantly lower amount and quality of input in the majority language while showing a more complex and articulated use of their minority language in the family context. In contrast, the other two groups denoted a higher cumulative exposure to Italian than their minority language. For what concerns language skills, the Arabic-speaking group revealed a significantly lower performance in the clitic pronoun production, vocabulary, and comprehension task, which was discussed by Vender et al. (2016) assuming that the degree and type of (minority) language use in the family contexts could have a critical effect on children's verbal skills in their majority language. These results indicate that information about the *quality of linguistic input* and the individual experience both in the minority and in the majority language is a better predictor of verbal abilities than a traditional index of language exposure (for example, the number of years spent in Italy). Although it is difficult to disentangle whether language difficulties observed in Arabic-speaking children were due to their minor cumulative exposure to Italian or simply to the distances between the two languages spoken by children, the study of Vender et al. (2016) highlights the importance of considering cumulative when investigating group differences in language skills of bilinguals. Even more if we consider that often this variable characterizes differences across groups of immigrants and reflects their tendency to maintain linguistic and cultural habits of the country of origin.

2.3. Language use and experience and their impact on reading skills

Considering all the above-mentioned pieces of evidence, several factors in bilingualism can influence verbal competence and, as a consequence, reading skills. We will use the expression "language use and experience" to consider all these aspects together in their interaction. In our view, "language use and experience" refers to a spectrum of person-specific linguistic variables that can impact the language competence and reading skills of MLC. In this line, we considered "language use" variables related to cumulative exposure, such as the two languages' context of use, the daily amount of exposure to two (or more) languages, and the quality of the language input. Concerning "language experience", we included some relevant aspects of the individual language history such as the age of first exposure, length, parent's origin, and family cultural habits as indicated in the literature.

Although all the variables grouped under the wide terms "minority language use and experience" can affect language proficiency and, consequently, performance in verbal skills in the majority language (Bedore et al., 2012; Sorenson Duncan and Paradis, 2016; Grøver et al., 2018; Unsworth et al., 2018), there is still a gap in knowledge about the relationship between language use and experience and reading outcomes in minority language students. Filling this gap is a relevant goal for improving clinical practice in evaluating MLC for reading disorders (cf. Vender et al., 2016, and the more recent work of Guasti et al., 2021).

2.3.1. PLQ - an interview for the assessment of bilingualism in children

In the current section, we will describe the development of the *"Intervista sulle Prassi Linguistiche Quotidiane"* (PLQ - in English *"Daily Linguistic Practice Interview"*), an instrument aimed at testing language use and experience in multilingual school-age children.

According to the literature, when assessing the linguistic history of multilingual speakers, it is necessary to collect information about speakers' linguistic habits and preferences, as reported in well-established questionnaires of bilingualism assessment. Some examples of this type of questionnaires/interviews are the Language Experience and Proficiency Questionnaire (LEAP-Q; Marian et al., 2007), the Language History Questionnaire (LHQ; Li et al., 2006; 2014, 2020), the Language and Social Background Questionnaire (LSBQ; Anderson et al., 2018), the Alberta Language and Development Questionnaire (ALDeQ; Paradis et al., 2010), the Alberta Language and Development Questionnaire Italian Version (ALDeQ-IT; Bonifacci et al., 2016), the Utrecht Bilingual Language Exposure Calculator (UBiLEC; Unsworth, 2011a; 2011b, 2013), and the Bilingual Language Profile (BLP; Birdsong et al., 2012). It is worth noting that usually, questionnaires for the assessment of children's bilingualism ask parents to self-rate the language use and exposure of their children (Gutiérrez–Clellen and Kreiter, 2003; Paradis et al., 2010; Squires et al., 1997; Thordardottir and Weismer, 1996; Unsworth, 2011a, 2011b, 2013). However, we were interested in developing an instrument that could be easily proposed as a structured interview with children without needing parents' mediation. This last need arose from the fact that MLC are so often more competent than their parents in the majority language. Indeed, with these kinds of participants, questionnaires for parents, when not delivered in the minority language, are often inconclusive, while more relevant information can be gathered from the child. Although the best practice should be providing assessments in the minority language for both parents and children, issues related to the difficulties in providing material and testing participants in the minority language cannot be ignored if one wants to build a structured interview to be used in clinical contexts.

Intending to build a complete and comprehensive interview for the assessment of language use and experience, we reviewed the characteristics of the previously mentioned instruments, and, in particular, the structure of those that were developed for adult bilinguals that are, thus, usually self-report instruments (Anderson et al., 2018; Li et al., 2006, 2014, 2020; Marian et al., 2007).

Li et al. (2006, 2014, 2020) proposed a new tool, the LHQ, divided into four sections: 1) *Background*, which investigates linguistic history; 2) *Proficiency*, i.e., the effectiveness in speaking two or more languages; 3) *Usage*, namely, context and habits of language use; 4) *Dominance*, including dominance and cultural identity of the languages acquired. The investigation of these areas provides crucial information in assessing the linguistic experience of bilingual participants. Therefore, most of these aspects, namely background (i.e., linguistic history) and usage (regarded as a more complex measure of language exposure), were included in our interview too. Regarding proficiency, most questionnaires targeting adult bilinguals are largely based on a self-rated evaluation of language mastery (LHQ, Li et al., 2006; 2014, 2020; LEAP-Q, Marian et al., 2007). In contrast, as the current interview taps onto a developmental population, we opted for an indirect way to assess language proficiency. We included a scale that investigates the preferred language in automatized skills such as counting, thinking and everyday activities such as reading a book and watching television.

Along this line, a more recent questionnaire by Anderson et al. (LSBQ, 2018) assumes that bilingualism is not a discreet condition, but a dichotomous variable. Instead, it might be represented as a continuum characterized by proficiency in the two languages and, even more

importantly, by the degree of use of each one in family and social contexts (Luk and Bialystok, 2013). This last aspect, which explores to what extent the cultural background related to a specific language is intrusive in the linguistic experience of a bilingual speaker, was also included in our interview. Indeed, the *PLQ Interview* investigated both family and extra-family (i.e., social) language use, providing a score that quantifies the degree of use and intrusiveness of the majority language on a polar continuum in which activities carried out in the minority language are rated with a positive (+) score. In contrast those carried out in the majority obtain a negative score (-). In this perspective, activities like watching television, chatting with family and friends, and listening to music that children report doing in the minority language, together with information about religious habits, are considered as a mirror of how much the culture of origin is preserved in the family and, thus, what is the child's cultural background. To deepen this aspect we have added some information about the reading habits of the family. Our instrument asks whether parents read stories to children (in the past or now) and in which language (the minority and the majority). This was done both because reading practices in the family can predict the child's reading development (Sénéchal and LeFevre, 2002; LeFevre et al., 2010), and because aspects concerning reading and book availability at home can be considered in relation to socio-economical status (Korat et al., 2007).

An additional crucial factor, namely the differential degree of exposure to the languages, is usually assessed as a self-reported percentage of hours of exposure (LHQ, Li et al., 2006; 2014, 2020; LEAP-Q, Marian et al., 2007). Alternatively, it might be evaluated as the number of activities carried out in each language through a Likert scale (for example, Anderson et al., 2018). These types of self-reported estimations are, however, not reliable with children, who need a more intuitive representation to provide this information. As already mentioned, this kind of information was gathered by asking parents in UBiLEC (Unsworth, 2011a, 2011b, 2013), but we developed a new analogic self-report measure of language exposure based on clocks for letting the child inform us about language exposure at home. Posed in front of a time wheel similar to a clock in which midnight, midday, and day quarters are signed (see Fig. 1), children are asked to paint the number of cloves corresponding to hours spent on different activities in different colors. Two clocks assess time spent speaking the minority language

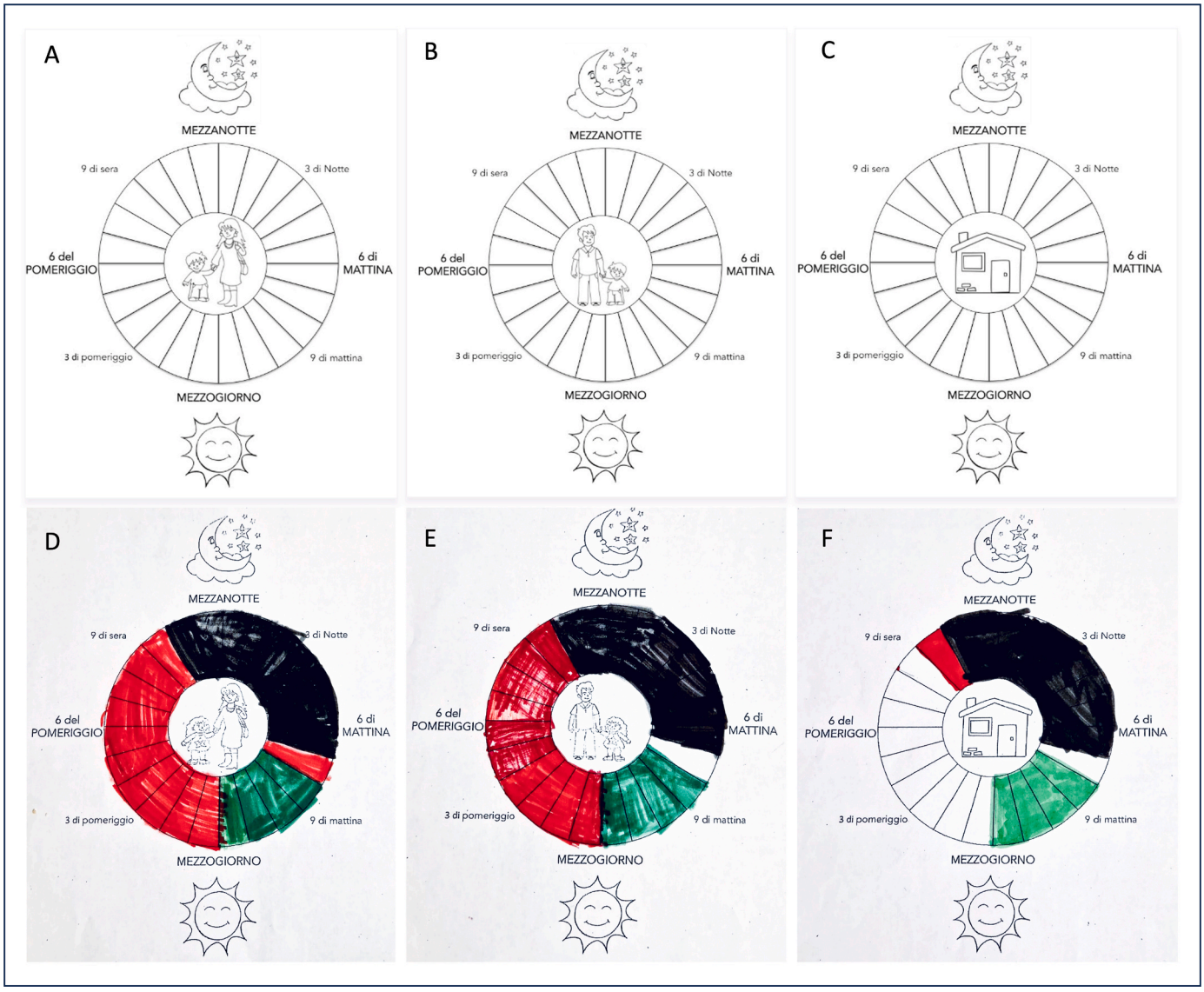

Fig. 1. Clocks included in the PLQ interview are reported in the figure. In particular the upper panel shows the clocks of active speaking with Mother (A), active speaking with Father (B) and Passive Listening (C). In the lower part, panels D-E-F report the same clocks painted by a female participant included in our sample, during the experimental session. The participant was instructed to paint in black cloves concerning hours spent sleeping, in green hours spent at school, and in red hours spent in speaking with parent's or listening to the minority language.

with parents, while a third assesses passive listening to the minority language. This new measure was inspired by the use of different types of Visual Analogue Scale (VAS) in child research on stress, emotions (ex. Bernstein and Garfinkel, 1992; Lesage et al., 2012), and pain (Bailey et al., 2012; De Jong et al., 2005; de Paula Reis Barrêtto and Almeida Pordeus, 2004; de Tovar et al., 2010), and considering the reported effectiveness of this approach on young participants (Le May et al., 2018; Shields et al., 2003; Van Laerhoven et al., 2004).

To sum up, the *PLQ Interview* was presented to primary students to gather information about the linguistic history, minority and majority language use, cultural background, and language preferences. By including the three clocks as an additional measure of exposure, our instrument allowed us to collect important information about the daily use and experience of the child in both languages. As far as we know, this is the first and only instrument directly addressed to school-aged children in the Italian context.

2.4. Aim of the study

The current study aims at (1) presenting an instrument for assessing the language experience, in terms of daily practice, in a sample of minority language primary students; (2) establishing the association between variables related to daily linguistic practice and the MLC's reading outcomes. This would have relevant implications for both the educational and the clinical perspectives.

3. Method

3.1. Participants

Data of 79 primary students were included in the present study, 32 of them (F = 18, M = 14; age on average = 8.53, sd = 0.35) were 3rd graders, 27 (F = 9, M = 18; age on average = 9.64, sd = 0.43) were 4th graders and 20 (F = 11, M = 9; age on average = 10.68, sd = 0.37) were 5th graders (see Table 1 for demographic descriptive data).

Participants were a heterogeneous sample of children exposed to a minority language spoken within the family context (see parent's country of origin in Supplementary Table 1); most children (87%) were born in Italy, while only 10 out of 79 had only one foreign parent. Participants were recruited in public schools in northern and central Italy ("I.C. La Torre", Chiavari (Ge), and the "I.C. Lanfranco", Gabicce Mare and Grada (PU)).

All participants had non-verbal reasoning skills within the normal range (Raven's Matrices were all >50° percentile). None of the children were identified as having psychiatric, emotional, or sensory disabilities and all participants had normal or corrected-to-normal visual acuity. Informed consent was obtained from parents, and children gave their verbal consent. The study was conducted according to the World Medical Association Declaration of Helsinki's ethical principles and has been approved by the Ethical Committee of the University of Urbino Carlo Bo (nr. 11, 20 August 2018).

3.2. Reading and cognitive assessment

Children included were first evaluated with respect to their cognitive functioning using The Raven Coloured Progressive Matrices (Raven, 2008). Moreover, we collected other neuropsychological measures related to working memory, phonological awareness, and lexical retrieval. The descriptive statistics of these variables are reported in Supplementary Table 2.

Reading skills were assessed by means of standardized tests currently used in Italy to certify developmental dyslexia. Single word reading and pseudowords reading were investigated through the DDE-2 Battery (Batteria per la Valutazione della Dislessia e della Disortografia Evolutiva-2; Sartori et al., 2007).

Text reading was assessed through the MT reading test (Cornoldi and Carretti, 2016), a battery frequently used in Italy for reading assessment, consisting of narrative texts of different lengths and difficulties, according to the age and education of readers.

All reading tasks were administered individually by presenting each child with a sheet containing four vertical lists of 28 words each, a sheet containing three vertical lists of 16 pseudowords each, and a sheet containing the short story. Children were asked to read aloud as fast as they can. Total reading time (in seconds) and number of errors were recorded for each sheet. To make data comparable between tasks and participants' ages, we assumed as raw scores for all reading tasks the syllables by seconds as a parameter of reading speed and the percentage of accuracy as a parameter of accuracy (descriptive statistics are reported in Supplementary Table 2).

3.2.1. PLQ interview – L'intervista sulle Prassi Linguistiche Quotidiane (Daily linguistic practice)

Our new instrument is conceived as a structured interview to collect information about linguistic history, minority and majority language use, cultural background, and language preferences. Accordingly, the interview is organized in three scales.

Scale A) ***Linguistic practice and use in the Family context***: this scale asks for information about the child's daily use of language with parents and family (brothers or other family members living in the same house), as well as some information about the language history and experience (age of first exposure, language first learned, etc.).
Scale B) ***Linguistic practice and use in the Extra-Family context***: this scale investigates the child's language of education, extra-school-time habits, and preferred languages for social interactions with peers, namely language use and experience outside the familial context.
Scale C) ***Linguistic preferences and habits***: this scale investigates the child's first language of education, writing skills, and language preferred for some individual and automated activities like counting, thinking, etc.

Questions and areas of interest investigated by the scales are summarized in Table 2.

In addition, Scale A includes three clocks.

1) ***Mother's clock***: graphically represents the time spent speaking the family minority language with the mother (see Fig. 1A);
2) ***Father's clock***: graphically represents the time spent speaking the family minority language with the father (see Fig. 1B);
3) ***Passive Listening***: graphically represents the time spent listening to parents (or other relatives) speaking the family minority language (see Fig. 1C).

The interview has been proposed individually to each child always following the same structured order of questions and providing, whether necessary, additional information for a better understanding of each question. Answers were converted in numerical scores: lower scores were attributed when children reported to carry out specific activities in Italian, while higher scores were attributed when children reported to carry out specific activities in the minority language.

For what concerns clocks, children were asked to think at a typical weekday and paint in black the cloves corresponding to the hours spent in sleeping, in green the cloves corresponding to the hours spent at school, and in red the cloves corresponding to the hours spent speaking with mother/father or passively listening the minority language in family (see Fig. 1). Each one of these activities were quantified in terms of percentage for the analysis, by considering the number of cloves painted of the total, i.e., in the 24 h of a day.

Table 1
Demographical data.

Grade	n	Gender (F/M)	Born in Italy	Age (years)	sd	min	max	Age (months)	sd	min	max
3rd	32	18/14	31	8.53	0.35	7.75	9.16	102.37	4.24	93	110
4th	27	9/18	18	9.64	0.43	9	10.66	115.74	5.24	108	128
5th	20	11/9	20	10.68	0.37	9.91	11.41	128.2	4.53	119	137

3.3. Analysis

Analyses were implemented in the R environment (R Core Team, 2020). First, a non-parametric (Spearman's Rho) correlational matrix has been calculated on scales, clocks, and reading indices (word/-pseudoword/text reading in accuracy and fluency), using the *rcorr* routine of the "Hmisc" R package (Harrell and Harrell, 2019). Further, a heatmap graph was extracted by the correlational matrix using the *cormat* routine of the package "corrplot" (Wei et al., 2017).

As a second step, we tested the influence of the three scales on reading skills separately, by means of linear regressions, including the Socio-Economic Status (SES)[3] of parents as a fixed factor.

Analyses were run using the *lm* routine of the "stats" package and were designed as multiple linear regressions including age as a continuous predictor.

When data did not fit with a normal distribution, alternative families of distribution were applied; in particular, as data of reading accuracy resulted censored, a Tobit family distribution (Long, 1997; McDonald and Moffitt, 1980) was applied through the R package VGAM (Yee, 2008).

Similarly, after having explored correlations between the three clocks, we tested the effect of the Mother's and the Passive listening clocks on each reading measure.

3.4. Results

The correlational matrix has been calculated on data of 77 participants (age on average = 9.45, sd = 0.96), as two participants with some missing data were removed. Correlations were then plotted in a heatmap (Fig. 2), from which two main clusters emerged: one related to all indices of the interview and the second concerning reading measures. We explored this pattern graphically by clustering based on the heatmap and isolating the cluster dendrogram (Fig. 3). By looking at the dendrogram, the two main clusters isolated the PLQ's parameter (on the left) and cognitive measures (on the right). In particular, for what concerns the interview, scale A (Linguistic use in the Family context) and scale B (Linguistic use in the Extra-Family context) showed a moderate correlation (Spearman's Rho = 0.41, p-value <0.001; see Table 3). In contrast, a very weak correlation was found between Scale A and Scale C (Linguistic preferences and habits) (Spearman's Rho = 0.23, p-value = 0.04). No correlations emerged between Scale B and Scale C (Spearman's Rho = 0.13, p-value = 0.24). Strong correlations were found between all the clocks (see Table 3 and Figs. 2–3).

3.4.1. Daily linguistic practice

As emerged by correlations, all indices (scales and clocks) of the *PLQ Interview* were related. Although there was less association for Scale C. Accordingly, to avoid multicollinearity, separated regressions were run for testing the effect of each scale on each reading measure. Results, reported in Table 4, revealed that the family and extra-family daily linguistic use (Scale A and B) moderate performances on word reading accuracy, while all the scales including the one concerning linguistic preferences (Scale C), influence accuracy in text reading. Interestingly, Scale C also influenced Text reading fluency (see Table 4). Here it is worth noting that the relationship between the three scales and reading skills is always negative, suggesting that the higher the scores in family language use, the slower and the less accurate the reading. No effects of parents' SES emerged.

3.4.2. Effect of family minority language exposure

As data revealed, children spent more time talking with their mother using the family language (mean = 14.3%, sd = 14.37) than with their father (mean = 8.51%, sd = 10.38; Mann-Whitney-Wilcoxon Test: W = 3697, p-value = 0.02). For this reason, we considered only the Mother's clock and the clock of foreign language Passive Listening in the analysis.

Effects found through multiple regressions are summarized in Table 5. As can be noticed, the influence of family language exposure on reading skills had a negative direction; this was the case for both the Mother's clock and the Passive Listening clock. This means that the higher the time spent speaking/listening to the family minority language, the lower the fluency and accuracy in reading. Also, no effects or parents' SES emerged in this case.

4. Discussion

In this study, we present a new instrument to collect information about language use and experience in minority language children (MLC), the *PLQ Interview*. The interview results were then associated with MLC's reading performance to address whether the daily practice in language use can moderate reading skills in the majority language.

First, considering the instrument we used for assessing language use and experience, the results indicate that the indices of our interview (three scales and the three clocks) are positively correlated and contribute to a unique construct interpreted as "*language use and experience*". This evidence emerges from the heatmap and the dendrogram, i.e., the graphical representations of correlational patterns between cognitive and reading tasks and the indices of our *PLQ Interview*. The dendrogram reported in Fig. 3 depicts hierarchical relations among variables. In particular, we observed that scales A, that measures linguistic use and experience in the family context, and scale B, that measures linguistic use and experience in the extra-family context, were grouped in a unique cluster, while Scale C (i.e., linguistic preferences and habits) was grouped with the clocks; in turn, these two clusters belong to the same higher-level root. The correlation between the scale C and the clocks suggests that the degree of exposure and active use of the family minority language is associated with a higher number of activities carried out using this language. In the same vein, children more prone to use their family minority language for activities like thinking, counting, tv watching, and reading are usually more exposed to this language at home.

The hierarchical clustering isolated a higher-level branch that includes all cognitive measures when considering reading and cognitive tasks. This branch was composed of several lower-level clusters: (1) a cluster concerning working memory, (2) a cluster in which we found the unique contribution of the age (that correlated with almost all the reading tasks), and (3) a cluster for reading accuracy that dissociated from (4) one specific for reading fluency (see Figs. 2 and 3). This latter

[3] The Socio-Economic Status (SES) was computed based on the occupation of each child's parents. Occupations were classified using the International Standard Classification of Occupations (ISCO team, International Labour Office) and coded along 10 areas. Based on this classification, mothers' and fathers' occupation were collapsed in a unique score, resulting in a three-way classification (high-medium-low level of SES). See Supplementary Table 3 for details on the classification.

Table 2
A summary of the questions included in the PLQ Interview. Scores are attributed to each answer based on the language reported as used or preferred, to obtain a polar score. When the child reports to use Italian (i.e., the majority language) a lower score is usually attributed, while when the child reports higher usage or exposure to the minority language, a higher score is attributed. Accordingly, higher scores on each scale reflect a more intensive use of the minority language.

Scale A	Scale B	Scale C
Linguistic practice and use in the Family context	Linguistic practice and use in the Extra-Family context	Linguistic preferences and habits
Country of Birth	Did you attend bilingual schools in Italy, or school in which the main language was not Italian (ex. Japanese School, Deutch School, American or British schools)?	In which language did you learn reading and writing?
Age of arrival to Italy	If yes, for how many years?	Can you write in your parents' language?
Time spent living in another country	Do you attend catechism, religion classes, or church groups?	How many writing systems do you know and manage?
Father's country of origin	In which language the religion classes are done?	What language do you think in?
Mother's country of origin	Did you attend schools outside Italy? For how long?	What language do you count in?
Do you live with both your parents?	What is your school grade?	In which language do you prefer watching television?
How many languages do you speak?	School you are attending here in Italy is: full time/ partial time/etc …	What language do you prefer reading a book in?
Which is the one you speak better?	What are your extra-scholastic activities? (Sport, post-school, Dance, courses)	Do you listen to the music of your parents' country of origin?
What is the first language you've learned?	In which language do you speak with your classmates?	
In which language do your parents speak to each other?	In which language do you speak with your friends?	
What language do you predominantly use with your mother?	In which language do you write text messages?	
What language do you predominantly use with your father?	In which language do you write emails?	
Do you have brothers or sisters?		
Is someone else living at your home with your family? (Grandmother, aunt, etc …)		
Indicate the language you predominantly use for speaking with every person who lives with you		
Do you usually spend holidays in your parents' country of origin? How long? Does it happen every year?		
Before starting school do your parents read you a book?		
Do you read a book together before sleeping now?		
Language Exposure		
Mother's Clock	Father's Clock	Passive Listening Clock

evidence replicates some of our previous findings on a group of monolingual pre-adolescents (Carioti et al., 2019) and monolinguals aged between 9 and 11 (Carioti et al., 2023). These results are in line with the view that reading fluency is more related to measures of automaticity and speed of processing. In contrast, accuracy relies more on other components of linguistic knowledge, like phonemic awareness (Oakhill and Cain, 2012; Savage and Frederickson, 2005; Sunseth and Greig Bowers, 2002), lexical retrieval (Perfetti and Hart, 2002; see Perfetti, 2017 for a review), and verbal memory (see the PCA results in Carioti et al., 2023). These results suggest that specific aspects of daily language use and experience could influence reading parameters differently.

4.1. *Daily linguistic practice and MLC's reading skills*

The relationship between the MLC's reading performances and daily linguistic practice, assessed through the *PLQ Interview*, represents the novelty of the present study. Indeed, the results of the regressions contribute to further characterizing the complex pattern of correlations between the interview indices and reading parameters.

Scale A - *Linguistic practice and use in the Family context* – that asks information about child's language daily use with parents and family, and about the language history and experience, predicts reading outcomes in all accuracy parameters (single words, nonwords, and text reading). In contrast, Scale B - *Linguistic practice and use in the Extra-Family context* – that asks information about sports/religion and daily activities - predicts only the accuracy in reading tasks that imply a lexical identification (words and text). We can thus argue that the more frequent the minority language use in the family and extra-family context, the lower the accuracy in Italian word and text reading, i.e., lexical identification. This result could align with evidence reporting a lower proficiency of bilinguals in lexical access and retrieval in language tasks such as picture naming (Degani et al., 2019; Sullivan et al., 2018; see Bialystok et al., 2009 for a review). Moreover, our results seem to be coherent with those of Miękisz et al. (2017). They found a negative correlation between children's frequency of English (heritage language) use and their Polish (majority language) vocabulary scores in 2–3 years-old bilingual children. Our results are one of the first pieces of evidence to extend this issue from oral language to reading skills and open up a whole new question about how minority language use can also influence the development of writing skills. Interestingly, the relationship between family minority language use and experience and reading skills in the majority language described here is not influenced by parents' SES. This result can be due to the fact that we considered as SES the parents' occupational status, even if this usually one of the different aspects included in the concept of SES (see Sirin, 2005 for a review), and information about parents' years of education were considered more reliable predictors of learning outcomes in several studies (see Eccles, 2005 for a review). We needed to rely on this information about parents' job because we've obtained complete answers for all participants in this variable, while the variable "educational level" presented several missing data.

Scale C - *Linguistic preferences and habits* - offered some additional intriguing evidence. Our regression analyses suggest that this scale mainly influences text reading: the higher the child's preference for using the minority language, the lower the fluency and the accuracy of text reading.

Alphabetical knowledge of the minority language and higher minority language use preference have, thus, a particular impact on a reading task that requires not just the lexical identification and retrieval but also the use of morpho-syntactic and semantic information to increase fluency of lexical retrieval (Brothers and Traxler, 2016; Van Berkum et al., 2005; Wicha et al., 2004; Wildman and Kling, 1978). The effect on both fluency and accuracy measures may suggest that intensive minority language use might be associated with a lesser chance of taking advantage of the Italian syntactic and semantic sentence structures' while decoding. Further studies are needed to test this hypothesis

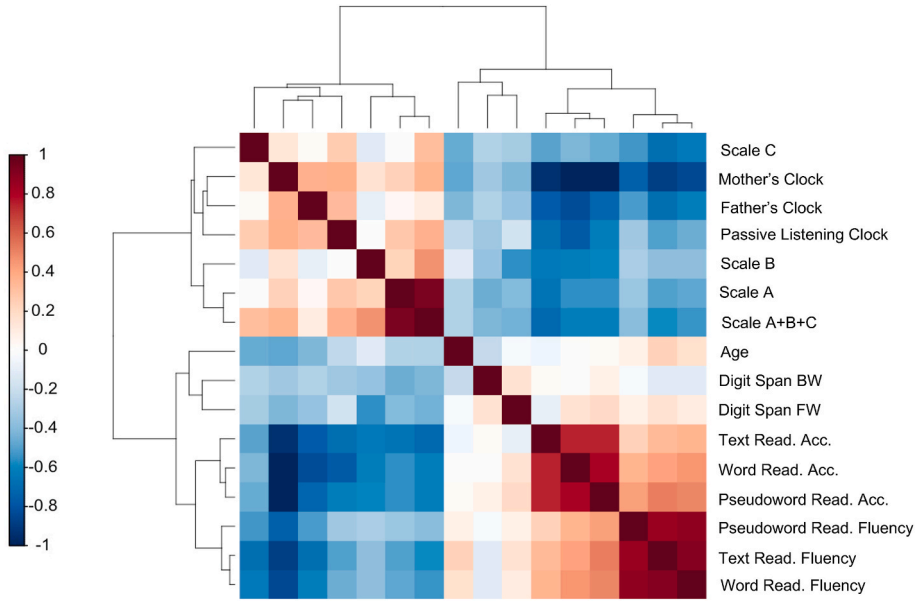

Fig. 2. Heatmap based on the non-parametric correlation matrix calculated on PLQ Interview's Scales and clocks, working memory measures and indices of reading skills. Red squares represent positive correlation, blue squares represent negative one. The darker the color, the stronger the correlation between variables. The dendrogram on the top and on the left side represents the result of a hierarchical clustering procedure computed with *hclust* algorithm with complete linkage method (see Murtagh, 1985 for a review). (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

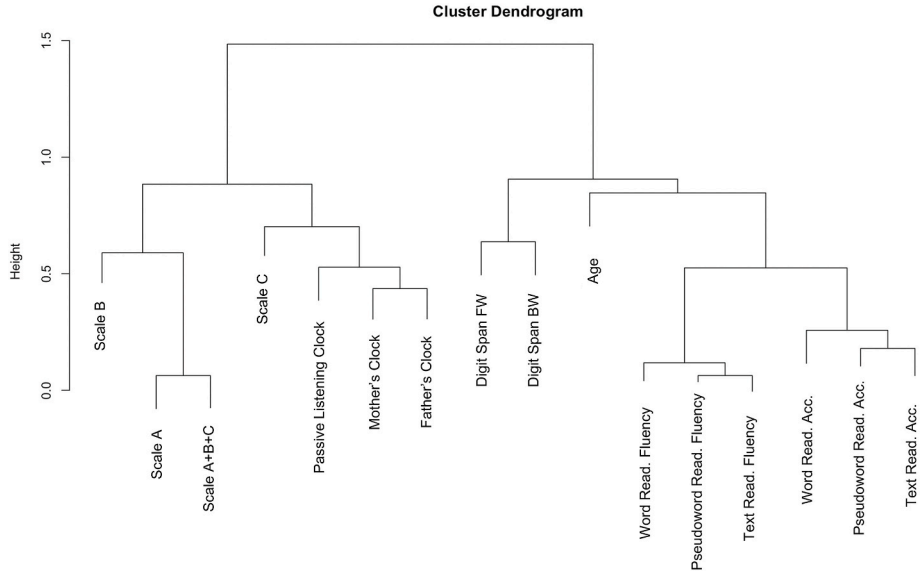

Fig. 3. The dendrogram graphically represents the results of the hierarchical clustering algorithm run from the correlational matrix.

explicitly.

4.2. *Influence of minority language exposure on MLC's reading skills*

Beyond the great interest in previously reported results, another innovative aspect of this study was to provide quantitative and self-reported indices of minority language exposure in terms of both passive listening and active use. To do so, we used some time wheel similar to clocks of 24 hours where midnight, midday 6 a.m. and 6 p.m. were highlighted, an analogic and intuitive way to measure the quantity of time that MLC spent actively speaking the minority language with the mother and father or passively listing other relatives speaking it. Children were asked to paint the cloves corresponding to the hours spent in these activities, providing us some easy-to-collect quantitative measures of exposure. These measures were used to investigate the influence of family minority language exposure on reading skills. Here it is worthy to note that time spent speaking the minority language with the father was not considered as we observed that children of our sample spent significantly more hours with their moms.

Based on our results, we observed a "Mother effect" on reading skills: the amount of time spent speaking the minority language with the mother (negatively) affected all the reading indices, particularly reading accuracy. Several studies suggest that the quantity and quality of the mother's language input, mother's education, and more in general, the daily contact with the family's country of origin's culture influence the child's minority language maintenance and proficiency, as well as an adequate learning and use of the majority language (Dixon, 2011; Paradis et al., 2020; Prevoo et al., 2014; Sorenson Duncan and Paradis,

Table 3
Non-parametric correlations between all indices of the Daily Language Practice Interview (Scales + clocks) and all measures of reading performance. Highest correlation coefficients are reported in bold.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Scale A	Scale B	Scale A + B + C	Total Score	Mother's Clock	Father's Clock	Passive Listening Clock	Age (years)	Digit Forward	Digit Backward	Word Reading (Syll./Sec.)	Word Reading (% acc.)	Pseudoword Reading (Syll./Sec.)	Pseudoword Reading (% acc.)	Text Reading (Syll./Sec.)	Text Reading (% acc.)
1	1															
2	**0.40*****	1														
3	0.23*	**0.13**	1													
4	**0.94*****	**0.59*****	**0.47*****	1												
5	**0.41*****	0.35***	0.33***	**0.50*****	1											
6	0.26*	0.15	0.25*	0.31*	**0.51*****	1										
7	**0.44*****	0.23*	**0.43*****	**0.51*****	**0.52*****	**0.48*****	1									
8	0.02	0.14	−0.13	0.01	−0.14	−0.09	0.05	1								
9	−0.08	−0.20	−0.01	−0.11	−0.09	−0.05	0.09	0.20	1							
10	−0.12	−0.04	0.01	−0.10	−0.02	0.01	−0.03	0.05	0.34***	1						
11	−0.14	−0.06	−0.26*	−0.19	**−0.42*****	−0.24*	−0.12	0.36***	0.31*	0.14	1					
12	−0.20	−0.25*	−0.10	−0.24*	**−0.54*****	**−0.41*****	**−0.37*****	0.24*	**0.34*****	0.24*	**0.58*****	1				
13	−0.03	−0.01	−0.18	−0.07	**−0.34*****	−0.17	−0.02	0.29*	0.29*	0.20	**0.90*****	**0.50*****	1			
14	−0.20	−0.23	−0.13	−0.24*	**−0.54*****	−0.33***	−0.24*	0.25*	0.38***	0.29*	**0.61*****	**0.85*****	**0.56*****	1		
15	−0.16	−0.06	−0.30*	−0.22	**−0.45*****	−0.30*	−0.16	**0.41*****	0.35***	0.13	**0.93*****	**0.55*****	**0.88*****	**0.63*****	1	
16	−0.28*	−0.26*	−0.15	−0.32*	**−0.50*****	−0.36***	−0.30*	0.18	0.16	0.25*	**0.50*****	**0.80*****	**0.41*****	**0.80*****	**0.49*****	1

Table 4
Results of multiple regressions run on each reading parameter. Fluency measures were normally distributed and were, then, analyzed with linear models, while accuracies were censored and so a Tobit family was applied.

(Parametric)	Word Reading							Pseudoword Reading						Text Reading					
		Estimate	SE	t	DF[a]	p-value	R^b	Estimate	SE	t	DF[b]	p-value	R^2	Estimate	SE	t	DF[a]	p-value	R^2
Fluency	*Intercept*	−0.4	0.97	−0.43	73	0.66	0.14*	0.03	0.58	−0.05	72	0.95	0.09	−1.03	1.07	−0.95	73	0.34	0.1**
	Scale A	−0.03	0.02	−1.42	73	0.15		0	0.01	−0.06	72	0.94		−0.04	0.02	−1.59	73	0.11	
	Age	0.3	0.1	3.20	73	0.002**		0.16	0.06	2.71	72	0.008**		0.43	0.11	3.88	73	<0.001***	
	SES_{Low}	0.1	0.38	0.27	73	0.78		0.08	0.23	0.37	72	0.70		0.11	0.42	0.26	73	0.79	
	SES_{Medium}	−0.08	0.4	−0.2	73	0.84		0.02	0.24	0.1	72	0.91		−0.13	0.45	−0.29	73	0.76	
	Intercept	−0.93	0.99	−0.93	73	0.35	0.13*	−0.12	0.59	−0.21	72	0.95	0.1	−1.65	1.09	−1.5	73	0.13	0.1**
	Scale B	−0.08	0.08	−1.01	73	0.31		−0.02	0.04	−0.62	72	0.57		−0.09	0.08	−1.1	73	0.27	
	Age	0.33	0.10	3.23	73	0.001***		0.17	0.06	2.79	72	0.006**		0.44	0.11	3.89	73	<0.001***	
	SES_{Low}	0.08	0.38	0.23	73	0.81		0.08	0.23	0.36	72	0.71		0.09	0.42	0.12	73	0.83	
	SES_{Medium}	−0.07	0.41	−0.17	73	0.86		0.02	0.24	0.05	72	0.95		−0.12	0.45	−0.26	73	0.79	
	Intercept	−0.24	1.00	−0.24	73	0.84	0.14*	0.13	0.6	0.21	72	0.82	0.1	−0.66	1.08	−0.6	73	0.54	
	Scale C	−0.10	0.07	−1.54	73	0.1		−0.04	0.04	−0.96	72	0.33		−0.16	0.07	−2.22	73	0.02*	0.2**
	Age	0.29	0.1	2.91	73	0.004**		0.15	0.06	2.59	72	0.01*		0.38	0.1	3.5	73	<0.001***	
	SES_{Low}	0.01	0.38	0.03	73	0.97		0.05	0.23	0.24	72	0.80		−0.03	0.42	−0.07	73	0.93	
	SES_{Medium}	−0.06	0.41	−0.15	73	0.87	0.87	0.01	0.24	0.06	72	0.94		−0.12	0.44	−0.27	73	0.78	
(Tobit distr.)		Estimate	SE	z	DF[a]	p-value	Log-likelihood	Estimate	SE	z	DF[c]	p-value	Log-likelihood	Estimate	SE	z	DF[b]	p-value	Log-likelihood
Accuracy	*Intercept 1*	85.22	6.88	12.38	150	<0.001***	−234.25 (df = 150)	65.51	13.61	4.81	146	<0.001***	−282.47 (df = 146)	93.59	4.36	21.42	140	<0.001***	−208.8 (df = 148)
	Intercept 2	1.72	0.08	19.41	150	<0.001***		2.40	0.08	27.52	146	<0.001***		1.26	0.08	14.33	140	<0.001***	
	Scale A	−0.41	0.17	−2.42	150	0.01*		−0.6	0.33	−1.97	146	0.04*		−0.31	0.1	−2.84	140	0.004**	
	Age	1.35	0.7	1.9	150	0.056		2.24	1.4	1.6	146	0.19		0.59	0.44	1.32	140	0.18	
	SES_{Low}	0.11	2.68	0.04	150	0.96		6.06	5.28	1.14	146	0.25		−0.26	1.7	−0.15	140	0.87	
	SES_{Medium}	−1.49	2.85	−0.52	150	0.6		2.69	5.59	0.48	146	0.63		−0.98	1.81	−0.54	140	0.58	
	Intercept 1	77.45	6.94	11.15	150	<0.001***	−233.85 (df = 150)	53.6	13.81	3.89	146	<0.001***	−282.55 (df = 146)	88.41	4.48	19.7	140	<0.001***	−208.04 (df = 148)
	Intercept 2	1.71	0.08	19.35	150	<0.001***		2.4	0.08	27.54	146	<0.001***		1.28	0.08	14.49	140	<0.001***	
	Scale B	−1.44	0.55	−2.6	150	0.009**		−2.13	1.1	−1.93	146	0.05		−0.85	0.36	−2.36	140	0.01*	
	Age	1.62	0.71	2.26	150	0.02*		2.64	1.43	1.84	146	0.06		0.75	0.46	1.61	140	0.10	
	SES_{Low}	−0.13	2.67	−0.04	150	0.96		5.66	5.29	1.07	146	0.28		−0.43	1.73	−0.24	140	0.80	
	SES_{Medium}	−1.63	2.84	−0.5	150	0.56		2.55	5.6	0.45	146	0.64		−1	1.85	−0.54	140	0.58	
	Intercept 1	85.92	7.17	11.98	150	<0.001***	−235.5 (df = 150)	66.62	14.28	4.66	146	<0.001***	−283.44 (df = 146)	93.77	4.59	20.39	140	<0.001***	−208.8 (df = 148)
	Intercept 2	1.73	0.08	19.56	150	<0.001***		2.41	0.08	27.66	146	<0.001***		1.29	0.08	14.59	140	<0.001***	
	Scale C	−0.91	0.5	−1.82	150	0.06		−1.4	1.01	−1.39	146	0.16		−0.64	0.32	−2.05	140	0.04*	
	Age	1.07	0.72	1.48	150	0.13		1.78	1.43	1.24	146	0.21		0.41	0.46	0.89	140	0.37	
	SES_{Low}	−0.62	2.74	−0.22	150	0.82		4.98	5.4	0.92	146	0.35		−0.79	1.76	−0.45	140	0.65	
	SES_{Medium}	−1.18	2.88	−0.41	150	0.68		3.22	5.66	0.57	146	0.56		−0.84	1.86	−0.45	140	0.65	

*p < 0.05, **p < 00.01, ***p < 0.001.
[a] 1 outlier has been removed.
[b] 2 outliers have been removed.
[c] 3 outliers have been removed.

Table 5
Results of multiple regressions testing the effect of Mother's clock and Passive Listening clock. Fluency measures were normally distributed and were then analyzed with linear models, while accuracies were censored and, thus, a Tobit family was applied.

(Parametric)		Word Reading						Pseudoword Reading						Text Reading					
		Estimate	SE	t	DF[a]	p-value	R^2	Estimate	SE	t	DF[b]	p-value	R^2	Estimate	SE	t	DF[a]	p-value	R^2
Fluency	*Intercept*	−0.08	0.9	−0.08	73	0.93	0.22***	0.22	0.57	0.39	72	0.69	0.15*	−0.54	1	−0.54	73	0.59	0.3***
	Mother's Clock	−0.01	0.006	−3.1	73	0.002**		−0.008	0.003	−2.12	72	0.03*		−0.02	0.006	−3.9	73	<0.001***	
	Age	0.28	0.09	2.98	73	0.003**		0.15	0.05	2.58	72	0.01*		0.38	0.1	3.73	73	<0.001***	
	SES_{Low}	0.03	0.36	0.09	73	0.92		0.06	0.22	0.28	72	0.77		0.01	0.39	0.04	73	0.96	
	SES_{Medium}	−0.18	0.39	−0.47	73	0.63		−0.03	0.24	−0,14	72	0.88		−0.28	0.42	−0.66	73	0.50	
	Intercept	−0.54	0.9	−0.58	73	0.56	0.18**	0.03	0.57	0.006	72	0.99	0.1	−1.16	1.02	−1.14	73	0.25	0.2***
	Passive Listening Clock	−0.01	0.007	−2.35	73	0.02*		−0.004	0.004	−1.04	72	0.30		−0.02	0.007	−2.88	73	0.005**	
	Age	0.32	0.09	3.28	73	0.001**		0.16	0.06	2.77	72	0.007**		0.43	0.1	4.03	73	<0.001***	
	SES_{Low}	0.19	0.37	0.5	73	0.61		0.11	0.23	0.49	72	0.62		0.22	0.41	0.54	73	0.58	
	SES_{Medium}	−0.01	0.39	−0.03	73	0.97		0.03	0.24	0.13	72	0.89		−0.04	0.43	−0.11	73	0.91	
(Tobit distr.)		Estimate	SE	z	DF[a]	p-value	Log-likelihood	Estimate	SE	z	DF[c]	p-value	Log-likelihood	Estimate	SE	z	DF[b]	p-value	Log-likelihood
Accuracy	*Intercept 1*	88.41	6.03	14.64	150	<0.001***	−224.43 (df = 150)	68.84	12.8	5.37	146	<0.001***	−278.13 (df = 146)	94.68	4.04	23.43	140	<0.001***	−200.97 (df = 148)
	Intercept 2	1.59	0.08	18.04	150	<0.001***		2.34	0.08	26.9	146	<0.001***		1.19	00.08	13.5	140	<0.001***	
	Mother's Clock	−0.22	0.04	−5.41	150	<0.001***		−0.33	0.09	−3.67	146	<0.001***		−0.12	0.02	−4.67	140	<0.001***	
	Age	1	0.62	1.62	150	0.10		1.86	1.32	1.4	146	0.15		0.4	0.41	0.97	140	0.33	
	SES_{Low}	−0.86	2.36	−0.36	150	0.17		4.13	5	0.82	146	0.40		−0.85	1.58	−0.54	140	0.58	
	SES_{Medium}	−2.71	2.51	−1.08	150	0.28		0.74	5.31	0.14	146	0.88		−1.81	1.7	−1.06	140	0.28	
	Intercept 1	82.35	6.46	12.74	150	<0.001***	−231.15 (df = 150)	60.1	13.62	4.41	148	<0.001***	−284.03 (df = 146)	91.25	4.32	21.08	140	<0.001***	−207.87 (df = 148)
	Intercept 2	1.67	0.08	18.98	150	<0.001***		2.42	0.08	27.74	148	<0.001***		1.28	0.08	14.47	140	<0.001***	
	Passive Listening Clock	−0.17	0.05	−3.55	150	<0.001***		−0.09	0.11	−0.86	148	0.39		−0.08	0.03	−2.43	140	0.01*	
	Age	1.47	0.68	2.16	150	0.03*		2.25	1.44	1.56	148	0.11		0.62	0.45	1.38	140	0.16	
	SES_{Low}	0.93	2.58	0.36	150	0.71		6.32	5.41	1.16	148	0.24		0.08	1.73	0.04	140	0.96	
	SES_{Medium}	−0.85	2.72	−0.31	150	0.75		3.57	5.7	0.62	148	0.53		−0.55	1.83	−0.3	140	0.76	

*p < 0.05, **p < 00.01, ***p < 0.001.
[a] 1 outlier has been removed.
[b] 2 outliers have been removed.
[c] 3 outliers have been removed.

2020; Willard et al., 2015). Nevertheless, here we observed that the enhanced exposure to the mother's language reduces, or at least slows, a complete reading acquisition in the language of education (i.e., Italian). This result is worth noticing as it affects, even to a lesser extent, accuracy, and fluency in pseudoword reading, i.e., the phonological processes. On the contrary, passive exposure to the minority language only impacts lexical identification processes (i.e., word and text reading). Although we obtained similar findings for Scale A and Scale B concerning reading accuracy, language exposure also affects fluency, showing a pervasive effect on reading skills.

According to these results, the simple use of clocks would be informative enough to comprehend better if the language experience may impact learning in the school context. Indeed, by asking the child information about the degree of exposure to the minority language, a teacher could understand whether lower performances in reading skills are due to the child's linguistic experience or need a clinical evaluation. The same information should be considered by clinicians when evaluating an MLC for developmental dyslexia. This pattern emerges when looking at average performances of MLC in reading indices (see Supplementary Table 4). MLC were, thus, less accurate based on standardization in all reading measures. A similar systematic disadvantage, probably induced by specific aspects of linguistic practice, makes MLC less proficient in reading, but not even in the range of a reading disorder (at least for what concerns lexical identification). Accordingly, this disadvantage must be considered when applying criteria for a diagnosis of developmental dyslexia to avoid the risk of increasing the number of misdiagnoses. This is even more important if we think to the fact that MLC are usually assessed with instrument conceived for monolinguals: indeed, only recently in Italy standardizations of clinical instruments addressed to bilinguals were provided (Marinelli et al., 2020). In this perspective, and aligned to our results, a good solution could be to reconsider cut-offs for this population in the light of the evidence reported here, as recently highlighted by the Italian national guidelines for the diagnosis. This point becomes more crucial if we reflect on the fact that different causes underlying reading difficulties can lead to different remediation measures. The evidence concerning reading difficulties observed in MLC simply suggests that this population has special needs that must be considered by the school for providing tailor-made teaching strategies and, thus, ensuring inclusive learning. Indeed, the weakness in reading skills observed in our sample of MLC, should be supported with specific teaching strategies aimed at incrementing majority-language exposure and lexical awareness, at least for this specific developmental period.

Lastly, further evidence emerge that seems to distinguish MLC with reading difficulties and children with dyslexia is concerning the age-effect. Age did not influence MLC's reading accuracy, i.e., no differences in the number of errors could be found between MLC of 3rd and 5th grade, something which is surprising if one considers standardizations on monolingual readers and developmental trajectories of both typical and dyslexic readers (see Tressoldi et al., 2001). Looking at this evidence, it seems that reading accuracy is more influenced by daily linguistic practice. Consequently, reading fluency should be considered the more reliable index to evaluate reading skills in MLC, especially in a shallow orthography like Italian. This result already emerged from the cross-linguistic meta-analysis by Carioti et al. (2021).

4.3. Conclusion

Our study follows in the wake of recent studies that have investigated the role of language exposure on cognitive functioning and learning in MLC, though providing novel insights about the role of minority language exposure on reading skills. Recent work, for instance, highlights the need of an immersive experience of both languages (Costa and Guasti, 2021) for proficient reading learning, while other work underlines to what extent variation in language experience can differentially affect cognitive control and language outcomes of bilinguals (see Zirnstein et al., 2019 for a review). Our results seem to strain the concept that bilingualism is a boost-up factor for cognitive skills, but with some critical caveats.

Crucially, we observed that the degree of minority language use in daily linguistic practice and the mother's and family's active role in promoting the minority language might negatively influence reading acquisition in the majority language if not adequately supported by specific lexical and vocabulary training activities. Accordingly, only supporting long-term balanced bilingualism by promoting the use of the minority language at home and specific lexical training in the language of education would turn the disadvantage shown by these primary students in reading skills into an advantage for the whole learning process.

In this perspective, our *PLQ Interview* would be helpful in both the educational and clinical context, as it represents a resource for understanding each child's linguistic background and habits and promoting learning support.

As mentioned above, the systematic bias of MLC in accurate lexical recognition should be considered in a new standardization of the reading tests to make the clinical neuropsychological evaluation more accurate. In this perspective, our *PLQ Interview* represents a new, comprehensive, and valid instrument for assessing daily linguistic practice and, thus, language use and experience of both minority and majority language in MLC, easy to adopt in schools and clinical contexts, as directly addressed to children.

Author contribution

Conceptualization: Desiré Carioti, Manuela Berlingeri, Mirta Vernice, Data curation: Desiré Carioti, Silvia Stefanelli, Marta Franca Masia, Ambra Giorgi, Giulia Del Pivo. Formal analysis: Desiré Carioti, Manuela Berlingeri. Investigation: Desiré Carioti, Silvia Stefanelli, Ambra Giorgi, Giulia Del Pivo, Marta Franca Masia, Milena Del Monte, Simona Travellini, Antonella Marcelli. Methodology: Desiré Carioti, Manuela Berlingeri, Silvia Stefanelli, Mirta Vernice, Maria Teresa Guasti. Project administration: Desiré Carioti, Silvia Stefanelli. Supervision: Manuela Berlingeri, Mirta Vernice, Maria Teresa Guasti. Writing – original draft: Desiré Carioti, Silvia Stefanelli, Mirta Vernice. Writing – review & editing: Desiré Carioti, Silvia Stefanelli, Manuela Berlingeri, Mirta Vernice, Maria Teresa Guasti.

Funding

This work was supported by an agreement between AST Marche Pesaro-Urbino and the Department of Humanities, University of Urbino Carlo Bo.

Ethic approval statement

The present research has been approved by the Ethical Committee of the University of Urbino Carlo Bo (nr. 11, 20 August 2018).

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

We thank for participating in our studies all students of "I.C. della Torre "of Chiavari (Genova)," I.C. Lanfranco" of Gradara and Gabicce Mare (Pesaro-Urbino) and their teachers, headteachers, and families. A big thanks also to families and participants recruited at the Center of Clinical Developmental Neuropsychology, AST Marche, Pesaro-Urbino.

All children included in this study shared with researchers their knowledge, language experience, and culture, in a beautiful cultural

exchange that enriched us as researchers and people. For this reason, we hope that this work will support inclusion and educational practices.

Big thanks also to Susanna Laurenzi, Gianmarco Giovagnoli, and Alexandra Perju, for the help they gave in data scoring.

The Daily Linguistic Practice Interview: a new instrument to assess language use and experience in minority language children and their effect on reading skills.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.amper.2024.100166.

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