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How bilingualism affects cognitive and linguistic skills in children with developmental language disorders

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Abstract

This study examined the linguistic and cognitive characteristics of two groups of Italian preschoolers with developmental language disorder (DLD): one group of monolingual Italian speakers and another of Italian-Slovenian bilinguals. The assessment focused on executive functions (EFs) (i.e., phonological working memory and inhibitory control) and linguistic abilities, which involved a multilevel analysis of discourse production. The bilingual group outperformed the monolingual group on tasks measuring EFs. While the two groups showed similar performance across several linguistic measures, the bilingual children demonstrated superior grammatical comprehension, albeit with high variability. A similar level of variability was observed in the bilingual group's phonological discrimination abilities. Both grammatical comprehension and phonological discrimination were significantly correlated with EFs. These findings are discussed in the context of current theories of linguistic development in bilingual children with DLD.

Highlights

- Diagnosis of DLD is challenging in bilingual children
- We compared EFs and linguistic skills in monolinguals and bilinguals with DLD
- Bilinguals had an advantage on EFs
- The two groups performed similarly on most linguistic measures
- Bilingualism does not exacerbate the symptoms of DLD

1. Introduction

Language is a complex cognitive skill that is usually acquired with apparent ease and naturalness (Kuhl, 2010). Nevertheless, some children may experience difficulties in language development even without hearing loss, intellectual disability, brain injuries or genetic syndromes. These children may receive a diagnosis of developmental language disorder (DLD; World Health Organization, 2022; Bishop et al., 2017; Sansavini et al., 2021). Importantly, they may also have other difficulties affecting procedural memory (Lum et al., 2011), motor control (e.g., Finlay & McPhillips, 2013), phonological working memory (Duinmeijer et al., 2012) and/or executive functions (EFs; Marini et al., 2020) such as updating, monitoring and inhibitory control.

1.1. Assessing DLD in bilingual children

A particularly delicate issue concerns the identification of children with DLD who are exposed to two or more languages. Based on the observation that the disorder affects 7 percent of preschoolers at 5 years of age but declines significantly (by about half) after just 1 year (Tomblin et al., 1997), similar percentages can likely be estimated for bilingual children (Grimm & Schulz, 2014). However, bilingualism poses serious difficulties for clinicians. If not adequately exposed to their two languages (e.g., if they do not receive a significant percentage of daily exposure to each language in contexts where these languages are needed to communicate with their interlocutors; e.g., Byers-Heinlein & Lew-Williams, 2013; Cattani et al., 2014), bilingual children may have a reduced lexical repertoire in both languages, diminished accuracy in verb usage, and difficulties in managing their morphological and morphosyntactic properties (Vender et al., 2016; Bialystok et al., 2010) compared to monolingual children. Crucially, such difficulties are often also found in monolingual children with DLD. For this reason, bilingual children with typical development

may be misdiagnosed with DLD (e.g., Paradis & Crago, 2000; Håkansson, 2001; Paradis, 2005; Paradis et al., 2008). For the opposite reason, children with difficulties in language development might not receive a timely diagnosis of DLD due to the challenges sometimes experienced in the development of their two languages. In the former case, this is referred to as mistaken identity (or overdiagnosis). In the latter, it is referred to as missed identity (or underdiagnosis) (Grimm & Schulz, 2014; Armon-Lotem, 2012).

Both types of diagnostic error stem from the observation that bilinguals may experience difficulties in developing some features of their languages. It should be noted, however, that a great deal of experimental evidence suggests that children with typical language development who have been adequately exposed to both languages reach developmental milestones in line with those observed in their monolingual peers (Paradis et al., 2011; Marini et al., 2016). Indeed, bilingualism does not appear to be a risk factor for lexical development in the early stages of development, provided that simultaneous bilinguals are exposed to both languages for a significant amount of time (e.g., Marini et al., 2017). Differences in the age of first exposure to a first (L1) and a second language (L2) (i.e., simultaneous, early sequential or late sequential), contexts of acquisition (e.g., at home or at school) and level of language exposure can significantly affect a child's linguistic development (Paradis et al., 2010; Cattani et al., 2014). A further complication arises from the potential effects of other cognitive functions on language development. Among these, phonological short-term and working memory play a key role in language development in children (Riva et al., 2017) and are correlated with language learning (Verhagen & Leseman, 2016), lexical acquisition and grammatical processing in children acquiring an L1 (Moscati et al., 2023) as well as in those learning an L2 (Engel de Abreu & Gathercole, 2012; Kormos & Sáfár, 2008). Importantly, working memory is also involved in one of the EFs (i.e., updating), which is needed to constantly update information during processing in language production and comprehension in daily communicative exchanges (Miyake et al., 2000; Mozeiko et al., 2011). This may affect the performance of children with DLD in lexical and grammatical production tasks (Marini et al., 2014).

Taken together, these considerations suggest the need to account for both environmental factors and cognitive variables when diagnosing DLD in children exposed to two or more languages. Only a comprehensive assessment of the child's bilingual experience and cognitive profile can enable a correct interpretation of his or her performance on standardized tests.

1.2. Language characteristics of DLD in bilingual children

Most studies investigating language characteristics in bilingual children with DLD have unfortunately not provided all the necessary information to properly interpret their linguistic performance. Nevertheless, the available evidence suggests that exposure to a bilingual context does not necessarily complicate language acquisition in bilinguals with DLD (Kohnert, 2010). Early simultaneous and sequential bilinguals with DLD have similar impairments to monolinguals with DLD in their respective languages (Paradis et al., 2003; Paradis et al., 2006; Håkanson et al., 2003; Rothweiler et al., 2012). For example, in the study by Paradis and colleagues (2003), three groups of 7-year-old children diagnosed with DLD (monolinguals exposed to English only, monolinguals exposed to French only and simultaneous bilinguals exposed to French and English) made similar morphosyntactic errors on a language production task. Specifically, all the children in the study made more errors (and showed similar levels of accuracy) when using inflectional morphemes to convey verbal tense information compared to other types of inflectional morphemes. Similarly, Rothweiler et al. (2012) assessed verbal morphology abilities in three groups: six monolingual children with DLD exposed to German; six early sequential bilingual children with DLD exposed to Turkish as their L1 and German as their L2; and six early sequential bilingual children with typical development exposed to the same languages. The two bilingual groups had been exposed to their L2 between the ages of 2 years and 9 months and 4 years and 4 months. The observation that both groups of children with DLD (bilinguals and monolinguals) experienced similar difficulties in maintaining subject–verb agreement in German suggests that a weakness in managing this agreement is a clinical marker of DLD in German for both monolinguals and early sequential bilinguals. This interpretation was further supported by a subsequent study by Clahsen et al. (2014), in which the same 18 participants from Rothweiler et al.' (2012) study showed no differences in another morphosyntactic feature of German, namely past participle inflection. Although the study did not control for the potential effects of cognitive variables such as working memory or EFs on these children's morphosyntactic difficulties, studies like those by Rothweiler et al. (2012) are particularly interesting because they compare bilinguals with and without DLD (see also Gutiérrez-Clellen & Simon-Cereijido, 2007). Indeed, while even bilingual children with typical language development may have difficulties in their L2, comparing their linguistic (lexical and grammatical) performance in L2 with that of bilingual children with DLD can lead to clinically incorrect conclusions. This may suggest potential difficulties in children exposed to an L2 who are otherwise developing language within the normal range (e.g., Windsor & Kohnert, 2004).

A second issue of fundamental importance is whether the disorder affects both languages in bilingual children with DLD in the same way (parallel disorder) or in different ways (differential disorder). The available data suggest that bilingual children with DLD acquire the languages they are exposed to more slowly than typically developing bilingual children (Håkansson et al., 2003) and experience similar difficulties in both languages (Restrepo & Kruth, 2000; Kohnert, 2010; Cleave et al., 2010; Marini et al., 2012), although some studies report divergent results (Jacobson & Livert, 2010). Over the past 15 years, some studies have begun to investigate the language performance of bilingual children with DLD using narrative assessment procedures (Rezzonico et al., 2015; Squires et al., 2014; Cleave et al., 2010). These studies suggest that such techniques are particularly informative compared to traditional assessments. For example, Cleave et al. (2010) compared the narrative skills in English of 14 monolinguals and 12 bilinguals, whose L1 was English and L2 varied. Both groups consisted of children with DLD. According to information from parents, the bilinguals were exposed to L2 in the family at least 25% of the time and spoke that language at least 10% of their day. Since the two groups differed in mothers' level of schooling, this variable was used as a covariate in the analyses. In two tasks designed to explore morphosyntactic production skills, monolinguals with DLD performed better than bilinguals. However, in a narrative production and a story retelling task, the two groups did not differ in any linguistic or narrative measures, showing similar morphological and morphosyntactic difficulties. Unfortunately, the authors of this study did not report the results of the narrative production and story retelling task separately. By presenting aggregate data from both tasks, they prevent the reader from making a qualitative assessment of the impact of each task on the children's overall

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performance. This poses a problem, as story retelling and narrative production tasks place very different cognitive and linguistic demands on children. The former relies heavily on long-term semantic memory, while the latter makes significant use of working memory (required to constantly update available information during story production), inhibitory control, monitoring, planning (i.e., EFs), and the ability to select the type of discourse and organize it structurally and conceptually. In this regard, Marini et al. (2012) compared the linguistic abilities of nine bilingual children with DLD, aged 6 to 13 years, who were exposed to Friulian (L1) and Italian (L2). The linguistic assessment was conducted in both languages, using tasks that measured lexical and grammatical comprehension, sentence repetition, semantic fluency and a narrative sample elicited through the Nest story cartoon picture by Paradis (1987). Most participants exhibited similar difficulties in both languages (parallel disorder) and produced stories with comparable levels of productivity, measured by the number of words produced and average utterance length. Their stories also contained a similar number of unique words (i.e., types) and similar percentages of phonological, morphological and semantic errors.

Overall, the results of the studies conducted so far suggest that, to adequately describe the language profile of bilingual children with DLD, it is essential to gather information about their bilingual history and cognitive profile. Additionally, their language abilities should be assessed using equivalent tests across languages, with the inclusion of narrative production tasks. In a recent investigation, Marini et al. (2019) compared working memory and linguistic skills of a group of simultaneous bilingual children with typical development to those of a cohort of simultaneous bilinguals diagnosed with DLD. Both groups were exposed to Italian (L1) and German (L2) since birth and lived in a bilingual area of Italy where the two languages are constantly used by speakers. The linguistic assessment was conducted in both languages using equivalent forms of the same test battery: the Italian and German versions of the Battery for Language Assessment in Children aged 4 to 12 (BVL_4–12; Marini et al., 2015). Importantly, the two groups of children were matched for several environmental factors, such as the amount and type of exposure to both languages, socioeconomic level and reading level within their families). The authors reported difficulties in phonological short-term memory in the cohort of children with DLD. This is consistent with previous findings in both monolingual (e.g., Marini et al., 2014; Montgomery, 2006) and sequential bilingual children with DLD (Engel de Abreu et al., 2014), extending this observation to simultaneous bilingual children with DLD. Furthermore, children with DLD had reduced lexical skills in both languages, which, in turn, contributed to lower levels of local coherence and lexical informativeness in their speech samples. Regarding grammatical parameters, children with DLD performed similarly to bilinguals with typical development, and both groups produced more morphological errors in German. This "language effect" is likely independent of the presence of DLD, but rather related to the different morphological organization of the two languages under investigation. Indeed, German presents additional difficulties compared to Italian, as inflectional morphemes require agreement not only by gender and number (as in Italian) but also by case. Further information about bilingual children with DLD exposed to Italian comes from other studies (e.g., Eikerling et al., 2023; Bonifacci et al., 2020). For example, in a study on heritage bilinguals living in Italy, Bonifacci et al. (2020) recruited two groups of sequential bilinguals with different L1s, both learning Italian as L2. The first group consisted of 35 children with typical development, while the second group included 20 peers diagnosed with DLD. The children's linguistic skills in Italian were assessed using standardized tests evaluating non-word repetition, lexical comprehension, grammatical production and comprehension, and narrative production. Additional information about the participants' socioeconomic status and linguistic background was gathered through questionnaires. In this study, children with DLD consistently performed worse than their peers with typical language development on almost all linguistic measures, including tasks assessing lexical comprehension and grammatical production and comprehension. Regarding their narrative production skills, they produced picture story descriptions with lower speech rates, reduced mean length of utterance and fewer unique words produced in each storytelling.

1.3. Cognitive skills in bilingual children with DLD

Bilingual children with typical development tend to show an advantage over monolinguals on tests of attention, EFs and working memory (e.g., Barac & Bialystok, 2011). However, the few studies exploring these skills in bilingual children with DLD have reported mixed findings (e.g., Boerma & Blom, 2020; Ebert et al., 2019; Sandgren & Holmström, 2015; Engel de Abreu et al., 2014; Ebert & Kohnert, 2011). Like monolingual children with DLD, bilinguals with DLD also show difficulties in phonological short-term and working memory. Engel de Abreu et al. (2014) specifically investigated whether EFs might be an area of weakness in bilingual children with DLD by comparing the performance of 15 bilingual children with DLD exposed to Portuguese (L1) and Luxembourgish (L2), 33 bilingual children with typical development exposed to the same languages, and 33 monolinguals with typical development exposed only to Portuguese. The two groups of bilingual children resided in Luxembourg but had been exposed to Portuguese from birth, while the monolinguals resided in Portugal. The authors did not find any group-related differences in tasks assessing visuospatial working memory skills. Consistent with the findings of Marini et al. (2019), bilingual children with DLD performed worse than both bilingual and monolingual children with typical development on a Digit Span Recall task, which assessed their phonological working memory skills. This supports the hypothesis that a phonological working memory deficit is a clinical marker of DLD, even in bilingual children. The results regarding the performance of the three groups on a flanker Task (assessing interference suppression and inhibitory control) and a sky search task (assessing visual selective attention) were particularly interesting. Bilinguals with typical development performed better than monolinguals with typical development on both tasks, supporting the idea that bilingualism enhances these cognitive functions. However, the cohort of bilinguals with DLD showed a mixed pattern. On the sky search task (i.e., selective attention), they performed similarly to both control groups. In contrast, on the flanker task (i.e., interference suppression and inhibition), they performed significantly worse than typically developing bilinguals but did not differ from monolinguals. The results of this very interesting study suggest that, although bilingual children with DLD do not show clear signs of difficulty, they may lack the same attentional and executive advantages observed in bilinguals with typical development on tasks assessing inhibitory control.

1.4. Aims of the study

In line with the previous considerations, the current investigation was designed to address four major research questions. The first

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question focuses on how bilingualism influences linguistic development in bilingual children with DLD: How does the linguistic performance of bilingual children with DLD compare to that of monolingual peers with DLD? Specifically, we aimed to explore this question by administering tasks that assess expressive and receptive phonological, lexical, grammatical and discourse-related skills in both languages, using the same battery of tasks (i.e., BVL_4–12; Marini et al., 2015) originally developed for Italian and later adapted for Slovenian. The second research question explores whether DLD affects the two languages of bilinguals differently, with one language being more compromised than the other in certain aspects of processing: How are the two languages impacted in bilinguals with DLD? The third research question examines how exposure to two languages affects EFs in children with DLD: How are updating, monitoring and inhibitory control impacted in bilingual children with DLD? Finally, the last research question explores the potential cognitive effects of bilingualism on language processing: Is there a relationship between updating and inhibitory control skills and the heterogeneous performance often reported in bilinguals with DLD?

To address these research questions, two groups of children with DLD were recruited for this experiment: one group of monolinguals exposed to Italian and another group of simultaneous bilinguals exposed to Italian (L1) and Slovenian (L2), living in Italy near the Slovenian border. The participants' bilingual and socioeconomic statuses, along with their levels of language exposure, were assessed, as well as their phonological working memory skills and inhibitory control abilities. Additionally, linguistic performance was measured through tasks in Italian for monolinguals and in both Italian and Slovenian for bilinguals. Based on previous findings, we hypothesized that (1) phonological, grammatical and narrative production abilities in the shared language (i.e., Italian) would be similar across both groups, indicating that bilingualism does not "worsen" language development, except for a potentially weaker lexical repertoire in bilinguals due to reduced exposure to L1 compared to monolinguals; (2) the linguistic abilities of bilinguals would be comparable across both languages; (3) bilinguals would benefit from frequent use of both languages cognitively, performing better than monolinguals on tasks assessing phonological working memory (i.e., updating) and inhibitory control; (4) measures of updating and inhibitory control would correlate with those linguistic variables where bilinguals show more heterogeneity than monolinguals in the shared language (i.e., Italian).

2. Materials and methods

2.1. Participants

Thirty Italian children, aged 5 years and attending the final year of preschool, participated in the study. They had been diagnosed with DLD at age 4 and had been receiving speech-language therapy since then. The children were divided into a monolingual and a bilingual group. The monolingual group consisted of 15 children exposed only to Italian. The bilingual group consisted of 15 children who had been exposed to both Italian and Slovenian since birth (i.e., they were all simultaneous bilinguals). Importantly, the two groups were balanced in terms of the type and severity of DLD, as assessed by administering the BVL_4–12 (Marini et al., 2015). Specifically, eight monolinguals had a diagnosis of DLD with primarily expressive language impairment, while seven had a diagnosis involving both receptive and expressive language impairments. As shown in Appendix A, five participants had severe difficulties producing phonologically well-formed words, two had severe naming difficulties, four had impairments in lexical comprehension, four struggled with grammatical comprehension, and three had difficulties producing grammatically well-formed sentences.

Among the bilinguals, seven had a diagnosis of DLD with primarily expressive language impairment, and eight had a diagnosis involving both receptive and expressive language impairments. As shown in Appendix A, eight had difficulties producing phonologically well-formed words, two had phonological comprehension issues, three had naming difficulties, one had a lexical comprehension impairment, and eight had grammatical difficulties. The bilingual children received linguistic rehabilitation in both languages.

Bilinguals were exposed to Slovenian because they used this language at home with at least one parent and attended schools in Italy where Slovenian is the primary language of instruction. Nonetheless, Italian is also taught as a subject, ensuring that students develop proficiency in both languages, fostering a bilingual environment where children can communicate in both Italian and Slovenian. This creates a rich code-switching context in which both languages are used by the same speakers (Green & Abutalebi, 2013).

All participants were recruited from Friuli Venezia Giulia, a region in northeastern Italy bordering Austria and Slovenia. None of the participants had intellectual disability (as assessed by Raven's Matrices) or auditory difficulties (as assessed by an audiometric screening). The administration of a questionnaire developed to assess the type of exposure to the two languages (see Appendix B) showed that the primary language of exposure (more than 60% of the time) was Italian for 53% (N = 8) of the participants, Slovenian for 40% (N = 6), while one child (7%) had comparable exposure to both languages. None of the children with DLD in the monolingual group were exposed to languages other than Italian. The two groups did not differ in age ($t_{(28)}$ = 1.706; p = .099; d = .415), level of formal education (all were attending the third year of kindergarten), gender [X^2 (1, N = 30) =3.394, p = .065; odds ratio: 4.125], parental education [X^2 (1, N = 30) =1.292, p = .256; odds ratio: 2.406], Raven's Matrices scores ($t_{(28)}$ = .126; p = .901; d = .046) or on the visual attention task from the NEPSY-II (Urgesi et al., 2011) ($t_{(28)}$ = .483; p = .633; d = .178) (see Table 1).

The parents of the participants provided written informed consent for their children's participation in the study and for the processing of their data. The study was approved by the Ethical Committee of the Region Friuli Venezia Giulia (CEUR), Italy (protocol n. 23826).

Table 1. General information regarding the two groups of participants. Data are presented as means (and standard deviations, SD) for age, raw scores at Raven's Matrices and standard scores on the visual attention subtest of the NEPSY-II in Italian. For gender and parental education, numerosity and percentages are shown.

General information	Monolingual DLD	Bilingual DLD
	(N = 15)	(N = 15)
Age	5.20 (.33)	5.05 (.39)
Gender	M = 11 (73%)	M = 6 (40%)
Parental education	Low = 11 (73%)	Low = 8 (53%)
Raven's Matrices	18.73 (4.92)	18.93 (3.67)
Visual attention (standard scores)	10.20 (3.12)	10.67 (2.06)

Legend: DLD = (children with) developmental language disorders.

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2.2. Assessment of updating skills

To assess their updating skills, all participants completed the forward and backward digit recall subtests of the Wechsler Scales (Wechsler, 1993) in both Italian and Slovenian. The former is a simple span task that evaluates a child's phonological short-term memory, while the backward digit recall is a complex span task used to assess the child's ability to manipulate information in phonological working memory. In the forward digit recall test, children were asked to repeat sequences of digits in the correct serial order. The sequences ranged from 1 to 9 digits, which the examiner produced at the rate of 1 digit per second. The number of sequences the child was able to repeat correctly forms the forward digit recall score. In the backward digit recall test, children were asked to repeat the sequence of spoken digits in reverse order. The number of sequences the child was able to correctly invert and repeat forms the backward digit recall score.

2.3. Assessment of inhibitory skills

The inhibition task from the Italian version of the NEPSY-II (Urgesi et al., 2011) was used to assess monitoring, self-regulation and the ability to inhibit automatic responses in favor of novel ones (i.e., *prepotent response inhibition*). Instructions for the test were given in Italian to all children. This timed test requires the child to look at a series of black-and-white shapes or arrows and name either the shape, direction or an alternate response, depending on the color of the shape or arrow. For this study, only Parts A and B were administered. Part A (*naming* condition) requires participants to name a series of shapes (squares and circles) or the direction of arrows (up or down). This test serves as a baseline measure of the child's ability to follow instructions, processing speed and monitoring skills. In Part B (*inhibition* condition) the child is shown the same shapes (circles and squares) but is required to say the opposite (e.g., "square" when a circle is shown). This assesses the child's ability to inhibit automatic responses and engage in cognitive control. In this condition, the child must constantly monitor performance and override automatic responses by selecting the correct opposite response.

2.4. Procedures of linguistic assessment

The linguistic skills of the participants were assessed by administering a selection of tasks from the Italian and recently adapted Slovenian versions of the *Batteria per la Valutazione del Linguaggio in bambini dai 4 ai 12 anni* (Battery for the assessment of language in children aged 4 to 12 – BVL_4–12; Marini et al., 2015). This Battery of linguistic tasks is routinely used in Italy for diagnosing language impairments in children. Each language was assessed separately on two different days, with the order of administration counterbalanced across participants. The assessment focused on phonological, lexical and grammatical expressive and receptive skills, as well as the participants' narrative discourse organization (in terms of global coherence and functional informativeness).

Measures of phonological and grammatical production, as well as narrative discourse organization and functional informativeness, were obtained by administering the picture description task of the BVL_4–12 (Marini et al., 2015). Children were asked to describe the events depicted in a vignette consisting of six colored drawings (the Nest Story by Paradis, 1987). To prevent referent sharing, the picture stimulus was displayed to the child on a laptop screen, and the experimenter pretended to be unfamiliar with the story. To avoid potential short-term memory limitations, the child was allowed to view the pictures throughout the entire description. The transcripts from the picture descriptions were analyzed using a multilevel procedure of discourse analysis, as thoroughly described elsewhere (Marini et al., 2011). This approach allowed the experimenter to calculate a percentage of phonological errors, grammatically complete sentences, errors of global coherence and lexical informativeness. The percentage of phonological errors was determined by dividing the total number of phonological errors (i.e., false starts, phonological paraphasias and neologisms) produced during the narrative production task by the total number of units (including both phonologically well-formed words and phonological errors) and then multiplying by 100. The percentage of grammatically well-formed sentences was calculated by dividing the number of grammatical sentences (i.e., utterances without omissions of content, substitutions or omissions of function words, or morphological errors) by the total number of utterances and then multiplying by 100. Discourse organization was assessed by the percentage of global coherence errors. This ratio was calculated by dividing the total number of such errors (i.e., utterances that are tangential, incongruent with the story, propositional repetitions or simple fillers) by the total number of utterances and then multiplying by 100. Finally, the communicative efficacy of each narrative was evaluated using a measure of lexical informativeness, which reflects the ability to select and produce words that are morphologically, semantically and pragmatically appropriate to the story). Specifically, lexical efficacy was determined by counting the total number of lexical information units (LIUs) produced in a narrative description. Words identified as errors of any kind, as well as those embedded in filler, repeated, incongruent or tangential utterances, were excluded from the LIU count. The percentage of lexical informativeness was calculated by dividing the LIUs by the total number of words and multiplying by 100. Two independent raters performed the scoring procedure, and their results were compared. Acceptable inter-rater reliability was set at Cohen's $k \geq 0.80$, with any remaining discrepancies resolved through discussion.

Phonological receptive skills were assessed using the phonological discrimination subtest of the BVL_4–12. In this task, children listened to 30 pairs of words, which could be either minimal pairs (N = 20) or identical items (N = 10), and were asked to determine whether the pairs of words they heard were identical. The stimulus words were chosen to require the child to discriminate between phonemes with various manners of articulation (e.g., stops, fricatives, affricates, nasals, etc.) and places of articulation (e.g., dental, bilabial, velar, labiodental, etc.). For the Slovenian version, the 20 minimal pairs and 10 identical items were selected to align with the specific phonotactic rules of Slovenian. In both versions of the test, one point was awarded for each correct answer. The percentage of phonological discrimination was calculated by subtracting the percentage of false alarms from the percentage of correct answers.

Lexical production skills were assessed using the naming subtest of the BVL_4–12. Children were asked to name up to 77 drawings depicting words with varying frequencies in Italian and Slovenian (for bilinguals), different grammatical classes (i.e., verbs and nouns) and various semantic features (action verbs and nouns from several semantic categories). Each correct answer earned the child 1 point, with a maximum naming score of 77.

Lexical comprehension was assessed using the lexical comprehension subtest of the BVL_4–12. Children were asked to identify which of four pictures represented the meaning of the word spoken by the examiner. The stimuli used for this test, all nouns, were

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carefully selected to control for frequency of use in both languages. The four pictures included a target stimulus, along with a semantic, phonological or unrelated distractor. For each correct answer, the child received 1 point, with a maximum lexical comprehension score of 18.

Finally, in the grammatical comprehension task children were asked to identify which of four pictures represented the meaning of a sentence spoken by the examiner. The four pictures included a target stimulus and three morphosyntactic distractors. One point was awarded for each correct answer, with a maximum grammatical comprehension score of 40. For each version of the test, grammatical comprehension was assessed using 40 sentences of varying syntactic complexity. The following sentence types were included: 9 active declarative sentences contrasting nominal features such as gender (masculine versus feminine), number (singular versus plural) and case (for Slovenian only), and a contrast in verbal number agreement and adjective gender and number; 6 active declarative sentences involving clitic object pronouns and reflexive structures; 9 reversible active and passive declarative sentences; 11 negative sentences, including active, passive, double negation and adversative structures; 5 relative active declarative sentences.

3. Statistical analyses

Potential group-related differences in cognitive and linguistic measures were explored using independent-samples t-tests, Mann–Whitney tests or Pearsons' chi-squared tests where appropriate after first checking for normality of the dependent variable using the Shapiro–Wilk test and potential violations of the assumption of homogeneity of variance using Levene's test for equality of variances. To control for false discovery rates, a series of Benjamini–Hochberg correction analyses for multiple comparisons (Benjamini & Hochberg, 1995) were applied to the analyses of between-group differences and for within-group comparisons, specifically for the assessment of updating skills, inhibitory control, phonological, lexical, grammatical and narrative skills. Within-group effects (i.e., differences between the two languages in the bilingual cohort) were assessed using paired-samples t-tests. For both between- and within-subject comparisons, effect sizes were calculated using Cohen's d.

The potential relationship between measures of updating (i.e., forward and backward digit recall) and inhibition (as measured by the number of errors produced on Part B [Inhibition condition] of the NEPSY-II inhibition task) and the linguistic variables that showed significant differences between monolinguals and bilinguals (i.e., phonological discrimination and grammatical comprehension, see Appendix A) was assessed separately for the two groups of children with DLD by using Pearson product–moment correlation coefficient.

4. Results

4.1. Assessment of updating skills (phonological short-term and working memory)

The group of bilingual participants with DLD outperformed monolinguals with DLD in Italian on both the forward ($t_{(28)}$ = 2.468; p < .020; d = .903) and backward digit recall tests ($t_{(28)}$ = 2.357; p < .026; d = .860), with large effect sizes. Additionally, paired-samples t-tests comparing bilingual participants' performance in the Italian and Slovenian versions of the forward and backward digit recall tasks revealed no significant language-related differences: forward digit recall ($t_{(14)}$ = .764; p = .458; d = .282); backward digit recall ($t_{(14)}$ = .1.705; p = .110; d = .429) (see Table 2).

Table 2. Results from the assessment of updating skills. Data are presented as means (and standard deviations, SD) of raw scores.

	Monolingual DLD	Bilingual DLD (Italian)	Bilingual DLD (Slovenian)
Forward digit recall*	4.60 (1.68)	6.00 (1.41)	5.80 (1.47)
Backward digit recall*	2.00 (1.13)	2.93 (1.03)	2.47 (1.06)

Legend: DLD = (children with) developmental language disorders. The asterisk (*) shows when group-related differences in Italian were significant. No significant differences were found in bilinguals between the two languages.

4.2. Assessment of inhibitory control

The ability of the two groups to monitor their performance and inhibit inappropriate responses was assessed using the inhibition task (Parts A and B) of the Italian version of the NEPSY-II (Urgesi et al., 2011). Both scalar and z-scores were considered for these tasks. Potential group-related differences in these scores were analyzed using two Mann–Whitney tests, one for inhibition Part A (the *naming* condition) and one for Part B of this test (the *inhibition* condition). For scalar scores, group differences were explored using two Pearsons' chi-squared tests. In both z- and scalar scores, monolingual participants with DLD made significantly more errors than bilinguals with DLD. Specifically, they achieved lower z-scores (Part A: U = 42.50, p < .003; d = 1.250; Part B: U = 27.00, p < .001; d = .652) and lower scalar scores (Part A: [X_2 (2, N = 30) = 11.930, p < .003; odds ratio: .001[1]]; Part B: [X^2 (5, N = 30) = 17.451, p < .004; odds ratio: .063]) in both versions of the task (see Table 3).

4.3. Assessment of expressive and receptive phonological skills

Data regarding expressive and receptive phonological abilities of the two groups of participants are presented in Table 4. Monolingual children with DLD performed as bilinguals with DLD on both % phonological errors ($t_{(28)}$ = .034; p = .973; d = .013) and phonological discrimination ($t_{(28)}$ = 1.718; p = .097; d = .634). Interestingly, a further assessment of the quality of their performance in Italian on these two tasks comparing their scores with normative data in terms of z-scores showed that the two groups did not perform differently on the % of phonological errors produced during the narrative production task but bilinguals had higher variability in their phonological discrimination abilities (as shown in Appendix A): % phonological errors [X^2 (3, N = 30) =3.168, p = .366]; phonological discrimination [X^2 (5, N = 30) =20.031, p < .001]. In the latter, the distribution of the scores was quite variegated for bilinguals with only 11 participants (72%) scoring within normal range (i.e., with z-scores between – 1 and 1). Two of them had a performance that was significantly below the expected mean (i.e., with z-scores between – 1.5 and − 2) and the remaining two with a performance significantly over the mean (i.e., with a z-score of 2). In contrast, all monolinguals with DLD scored within normal range on this task (i.e., with z-scores between 0 and 1). The within-group analyses paired-samples t-tests showed the absence of significant language-related differences in any of these two variables in the bilingual participants: % phonological errors ($t_{(14)}$ = 1.415; p = .179; d = .365); phonological discrimination ($t_{(14)}$ = 1.636; p = .124; d = .422).

[1]These two odds ratios have been calculated considering how many participants in each group reached at least the 50th centile (i.e., groups 51–75 e > 75).

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Table 3 Percentiles and z-scores obtained by the two groups of participants on the inhibition test of the Italian version of the NEPSY-II (Parts A and B, respectively). Data are presented as means (and standard deviations, SD) for z-scores. As for percentiles, the number of participants ranging in a specific percentile for each group is presented together with percentages. The percentile rank indicates the percentage of children in the normative group who scored at or below the child's score on the inhibition test. A child scoring at the 50th percentile has performed better than or equal to 50% of children their age. This is considered average performance (i.e., producing a normal number of errors). Percentile ranks above 50 indicate that the child performed better than most of his/her age group (i.e., producing fewer errors). Percentile ranks below 50 suggest that the child produced more errors.

	Monolingual DLD	Bilingual DLD
Inhibition A (errors)		
>75	5 (33.3%)	14 (93.3%)
51–75	5 (33.3%)	1 (6.7%)
26–50	0 (0%)	0 (0%)
11–25	5 (33.3%)	0 (0%)
6–10	0 (0%)	0 (0%)
2–5	0 (0%)	0 (0%)
Z-Scores*	.00 (.85)	.93 (.26)
Inhibition B (errors)		
>75	3 (20.0%)	14 (93.3%)
51–75	4 (26.7%)	0 (0%)
26–50	2 (13.3%)	1 (6.7%)
11–25	4 (26.7%)	0 (0%)
6–10	1 (6.7%)	0 (0%)
2–5	1 (6.7%)	0 (0%)
Z-Scores *	−.40 (1.12)	.93 (.26)

Legend: DLD = (children with) developmental language disorders. The asterisk (*) shows when a group-related difference in Italian was significant.

4.4. Assessment of lexical expressive and receptive skills

Data regarding the lexical production and comprehension skills of the two groups of participants in the two languages (for bilinguals) are presented in Table 4. No group-related difference was found in naming ($t_{(28)} = 1.290$; $p = .207$; $d = .471$) or lexical comprehension ($t_{(28)} = 1.645$; $p = .111$; $d = .601$). The assessment of the quality of their performance on these two tasks comparing their scores with normative data in terms of z-scores in Italian suggests that the two groups performed similarly on both tasks (see Appendix A): naming [X^2 (6, N = 30) =5.529, $p = .478$]; lexical comprehension [X^2 (5, N = 30) =6.410, $p = .268$]. The within-group analyses paired-samples t-tests showed the presence of significant language-related differences in both variables in the bilingual participants: naming ($t_{(14)} = 3.941$; $p < .001$; $d = 1.018$); lexical comprehension ($t_{(14)} = 2.567$; $p < .022$; $d = .663$). Indeed, on both tasks they performed worse in Slovenian.

4.5. Assessment of grammatical expressive and receptive skills

Data regarding grammatical production and comprehension skills of the two groups of participants are presented in Table 5. The analyses showed that participants with DLD produced the same number of grammatically complete sentences on the narrative production task ($t_{(28)} = 1.033$; $p = .311$; $d = .378$) but monolinguals understood fewer sentences on the grammatical comprehension task ($U = 28.50$, $p < .001$; $d = 1.222$) with a large effect size. Indeed, this was reflected in the qualitative analysis comparing their performance with normative data in Italian. These analyses showed group-related differences in the performance on grammatical comprehension [X^2 (5, N = 30) =21.761, $p < .001$] but not on the % of complete sentences [X^2 (4, N = 30) =7.384, $p = .117$] (see Appendix A). Overall, in grammatical comprehension the distribution of the scores was quite variegated for monolinguals with 11 participants (74%) scoring within normal range (i.e., with z-scores between –1 and 1) and the remaining four (26%) with a performance significantly below the mean (i.e., with z-scores between −1.5 and −2). In contrast, 11 bilinguals (80%) scored within normal range on this task (i.e., with z-scores between 0 and 1) and three (20%) performed significantly better than expected (with z-scores of 1,5). After controlling for multiple comparisons, a qualitative inspection of the different types of sentences that make up this test showed that the two groups did not differ on the comprehension of active declarative sentences [$t_{(28)} = 1.912$; $p = .066$; $d = .698$], active and reflexive sentences with clitic object pronouns [$t_{(28)} = 2.125$; $p = .043$; $d = .776$] or reversible sentences [$t_{(28)} = 2.244$; $p < .033$; $d = .820$]. Nonetheless, bilinguals performed better than monolinguals on sentences requiring more complex processing: negative sentences [$t_{(28)} = 3.602$; $p < .001$; $d = 1.315$] and relative sentences [$t_{(28)} = 3.157$; $p < .004$; $d = 1.153$] (see Table 6).

Table 4 Results (means and SDs of raw scores) of between group (bilinguals versus monolinguals) and within-group (Italian versus Slovenian in bilinguals) analyses of the phonetic/phonological (i.e., % phonological errors and phonological discrimination) and lexical (i.e., naming and lexical comprehension) abilities of the two groups of children.

	Monolingual DLD	Bilingual DLD (Italian)	Bilingual DLD (Slovenian)
% Phonological errors	8.95 (8.65)	9.06 (7.79)	13.02 (13.65)
Phonological discrimination	81.00 (25.51)	93.00 (9.02)	83.00 (22.90)
Naming[§]	65.80 (6.20)	61.93 (9.81)	39.80 (16.09)
Lexical comprehension[§]	15.27 (1.83)	16.33 (1.72)	14.73 (2.15)

Legend: DLD: (children with) developmental language disorders; [§] shows when within-group differences between performance in Italian and Slovenian were significant in the bilingual group.

Table 5 Results (means and SDs of raw scores) of between group (bilinguals versus monolinguals) and within-group (Italian versus Slovenian in bilinguals) analyses of grammatical (i.e., % complete sentences and grammatical comprehension) and narrative production (i.e., % errors of global coherence and % lexical informativeness).

	Monolingual DLD	Bilingual DLD (Italian)	Bilingual DLD (Slovenian)
% Complete sentences	40.96 (14.70)	32.90 (26.15)	20.05 (22.85)
Grammatical comprehension*[§]	25.47 (8.86)	33.47 (2.67)	30.60 (3.22)
% Errors of global coherence	9.50 (13.60)	4.24 (6.39)	9.22 (10.09)
% Lexical informativeness	76.31 (13.80)	83.70 (6.60)	80.28 (7.26)

Legend: DLD = (children with) developmental language disorders. The asterisk (*) shows when group-related differences in Italian were significant. [§] shows when within-group differences between performance in Italian and Slovenian were significant in the bilingual group.

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The within-group analyses paired-samples t-tests showed the absence of significant language-related differences in the number of grammatically complete sentences on the narrative production task ($t_{(14)} = 1.423$; p = .178; d = .277) in the bilingual group. However, in Slovenian bilinguals had lower scores on grammatical comprehension ($t_{(14)} = 4.291$; p < .001; d = 1.289). After controlling for multiple comparisons, no specific language-related differences were found according to the different types of sentences: active declarative sentences [$t_{(14)} = 2.500$; p = .025; d = .645], active and reflexive sentences with clitic object pronouns [$t_{(14)} = 0.791$; p = .442; d = .204], reversible sentences [$t_{(14)} = 2.467$; p = .027; d = .637], negative sentences [$t_{(14)} = 0.299$; p = .769; d = .077], relative sentences [$t_{(14)} = 0.564$; p = .582; d = .146] (Table 6). It should be observed that, even if not significant, a trend toward significance was found for active declarative and reversible sentences.

4.6. Analysis of narrative production skills

Data regarding the narrative skills of the two groups of participants are presented in Table 5. No significant group-related differences were found in % errors of global coherence (U = 130.50, p = .461; d = .495) or % lexical informativeness (U = 76.00, p = .137; d = .683). This was supported by the qualitative analysis with normative data in Italian showing the absence of group-related differences in the performance on both measures: % global coherence errors [X^2 (2, N = 30) =2.916, p = .233]; % lexical informativeness [X^2 (3, N = 30) =4.551, p = .208] (see Appendix A). The within-group analyses paired-samples t-tests showed the absence of significant language-related differences in both measures: % errors of global coherence ($t_{(14)} = 1.596$; p = .133; d = .287); % lexical informativeness ($t_{(14)} = 1.229$; p = .239; d = .311).

4.7. Relation between EFs and linguistic skills in monolingual and bilingual children with DLD

To answer the fourth research question, we aimed at assessing the potential relationship between measures of updating (as measured by forward and backward digit recall tasks) and inhibitory control and those linguistic variables where bilinguals were significantly more variable than monolinguals with DLD (i.e., phonological discrimination and grammatical comprehension).

Table 6 Results (means and SDs of raw scores) of between group (bilinguals versus monolinguals) and within-group (Italian versus Slovenian in bilinguals) analyses of grammatical comprehension skills divided per sentence type and of the production of morphologic errors (i.e., paragrammatisms) characterized by the erroneous use of inflective morphemes.

	Monolingual DLD	Bilingual DLD (Italian)	Bilingual DLD (Slovenian)
% Paragrammatic errors[§]	0.77 (1.333)	0.28 (0.73)	3.28 (3.58)
Declarative sentences	7.20 (1.78)	8.27 (1.22)	7.07 (1.67)
Declarative sentences with clitics	3.00 (1.41)	4.07 (1.34)	3.73 (1.22)
Reversible sentences	6.53 (2.72)	8.33 (1.50)	7.00 (1.56)
Negative sentences *	5.60 (2.77)	8.33 (0.98)	8.47 (1.41)
Relative sentences *	3.13 (1.51)	4.47 (0.64)	4.33 (0.72)

Legend: DLD = (children with) developmental language disorders. The asterisk (*) shows when group-related differences in Italian were significant.[§] shows when within-group differences between performance in Italian and Slovenian were significant in the bilingual group.

No significant correlation was found in the monolingual group between the measure of forward digit recall and phonological discrimination (r = .035; p = .902) or grammatical comprehension (r = .205; p = .463). In the bilingual group forward digit recall correlated with phonological discrimination (r = .644; p = .010) but not with grammatical comprehension (r = −019; p = .947). In monolinguals, the measure of backward digit recall correlated with both phonological discrimination (r = .617; p = .014) and grammatical comprehension (r = .540; p = .038). In bilinguals, it did not correlate with phonological discrimination (r = −.284; p = .306) but showed a significant correlation with grammatical comprehension (r = .738; p = .002).

No significant correlation was found between the measure of inhibitory control and grammatical comprehension (bilinguals r = .401; p = .138 / monolinguals r = .449; p = .093). However, in both groups the measure of inhibitory control correlated significantly with phonological discrimination (bilinguals r = −.596; p < .019/monolinguals r = −.764; p < .001).

5. Discussion

This study focused on the linguistic and cognitive characteristics of two groups of Italian preschoolers with a diagnosis of DLD: a group of monolingual native speakers of Italian and a group of simultaneous bilinguals exposed to Italian (L1) and Slovenian (L2). Bilinguals had variable levels of exposure to the two languages, with primary exposure to Italian in 53% of cases, Slovenian in 40% of cases and balanced exposure in 7% of cases. For the *first* research question ("How does the linguistic performance of bilingual children with DLD compare to that of monolingual peers with DLD?"), we hypothesized that the development of phonological, grammatical and narrative production abilities in Italian (i.e., the shared language) would be similar across the two groups of children with DLD but that we would observe greater interindividual variability in the bilingual group across all linguistic measures. Regarding the *second* research question ("How are the two languages impacted in bilinguals with DLD?"), we hypothesized that the linguistic abilities of bilinguals would be similar across their two languages. As for the *third* research question ("How are updating, monitoring, and inhibitory control impacted in bilingual children with DLD?"), we hypothesized that bilinguals would perform better than monolinguals on tasks assessing phonological working memory (i.e., updating) and inhibitory control. Finally, for the *fourth* research question ("Is there a relationship between updating and inhibitory control skills and the heterogeneous performance often reported in bilinguals with DLD?"), we hypothesized that measures of updating and inhibitory control would correlate with the linguistic variables where bilinguals would show greater heterogeneity than monolinguals in the shared language (i.e., Italian). The analyses addressed the four research questions, and the corresponding hypotheses were only partially supported. Regarding hypothesis 1, bilinguals performed similarly to monolinguals on tasks assessing their phonological production skills, lexical abilities and grammatical and narrative production in the shared language (i.e., Italian). Nonetheless, bilingual children performed better than their monolingual peers on grammatical comprehension and showed greater variability on measures of grammatical comprehension and phonological discrimination. Considering hypothesis 2, among bilinguals the linguistic performance was similar across the two languages on measures of phonological skills, as well as grammatical and narrative production.

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However, they showed better lexical and grammatical comprehension in Italian. Regarding hypothesis 3, despite being balanced on demographic and cognitive variables such as age, level of formal education (all participants were attending the third year of kindergarten), gender, parental education and performance on Raven's Matrices and the NEPSY-II visual attention task (Urgesi et al., 2011), analyses showed that bilinguals had a significant advantage on all measures of updating and inhibitory control (i.e., forward and backward digit recall and both parts of the inhibitory control task). Finally, regarding hypothesis 4, the correlation analyses support a relationship between measures of updating and inhibitory control and the two linguistic measures where bilinguals showed higher heterogeneity than monolinguals. These results will be discussed in the context of current theories on linguistic development in bilingual individuals with DLD.

The *first research question* focused on analyzing the linguistic performance of bilingual children with DLD on tasks assessing expressive and receptive phonological, lexical, grammatical and discourse skills in their L1, compared to a cohort of monolingual peers with DLD. Overall, these analyses revealed a mixed pattern, supporting previous findings that preschoolers with DLD experience difficulties in both language production and comprehension (e.g., Bishop et al., 2017), primarily in phonological and syntactic skills (Shahmahmood et al., 2016; van der Lely et al., 2011). Regarding phonological skills, bilinguals performed similarly to monolinguals in the percentage of phonological errors produced on the narrative production task. Both groups showed significant difficulties, with five monolinguals and eight bilinguals producing a substantial number of errors of this type (see Appendix A). A qualitative assessment revealed that both bilinguals and monolinguals primarily produced phonological substitutions (i.e., phonological paraphasias) rather than false starts or neologisms. Furthermore, the absence of articulatory difficulties throughout the assessment allowed us to rule out dysarthria in these children, highlighting a difficulty in processing the phonological code of selected lexical entries (Levelt, 1989). This is coherent with previous findings (e.g., Marini et al., 2020). Notably, the two groups did not differ in their performance on the phonological discrimination task, suggesting a discrepancy between impaired phonological processing in production and adequate phonological processing in comprehension. In this case as well, a qualitative assessment revealed greater heterogeneity among bilinguals (see Appendix A). Specifically, all monolinguals performed between 0 and 1 standard deviation above the mean, whereas two bilinguals scored significantly above the expected mean, two scored significantly below, and the remaining 11 scored within the normal range. This performance suggests that phonological processing may be affected differently in expressive versus receptive tasks. Indeed, experimental evidence indicates that phonological processing develops asymmetrically between comprehension (i.e., discrimination of perceived sounds and their categorization into phonemes) and production (which involves syllabic access, phonological encoding and articulatory planning and execution; Levelt, 1989). Although younger children may accurately perceive phonemes, they often struggle to pronounce them correctly (Fikkert, 2007), highlighting a discrepancy between phonological representations and their production (Munson et al., 2005). Interestingly, the bilingual group's performance on phonological discrimination contrasts with studies involving typically developing bilingual children, which have shown that exposure to two languages may enhance phonological discrimination abilities (Tremblay & Sabourin 2012; Antoniou et al., 2015). Constant exposure to different phonetic/phonological contrasts and prosodic patterns usually trains these children to attend to various phonological cues and different phonotactic rules in their daily routines, enhancing their phonological discrimination and auditory attention skills (Krizman et al., 2012). The overall performance on this task suggests that this enhancement may occur in children with DLD, but only in certain cases. Indeed, our findings also suggest that bilinguals are a highly heterogeneous group. As noted by Bialystok (2021), various sociological, biological and cognitive factors can affect these children's linguistic development, making it challenging to find two bilinguals with completely overlapping characteristics. From a methodological and clinical point of view, these findings further suggest that both raw data and normative scores should be used to thoroughly describe the linguistic features of bilingual children with DLD.

As for their lexical abilities, in both groups only few participants demonstrated a pathological performance on naming (monolinguals: 2; bilinguals: 3) and lexical comprehension (monolinguals: 4; bilinguals: 1) (see Appendix A). Interestingly, the analyses showed no group-related differences in Italian, suggesting that their lexical skills were similar, regardless of their bilingual or monolingual environment. As for their grammatical production and comprehension skills, in Italian the two groups produced the same number of grammatically complete sentences on the narrative production task, but monolinguals correctly understood fewer sentences on the grammatical comprehension task. This was supported by the qualitative analysis, which showed that none of the bilinguals scored below the expected range in grammatical comprehension, whereas four monolinguals had significant difficulties on this task. Additionally, three bilinguals scored significantly higher than expected. A qualitative analysis of the specific types of sentences in the grammatical comprehension task revealed that, in Italian, bilinguals performed better than monolinguals on sentences requiring more complex processing, such as negative and relative sentences, which have been shown to have a significant relation with phonological working memory in children (Moscati et al., 2023). This suggests that bilinguals had better grammatical comprehension skills than monolinguals and, as it will be discussed later, this may be explained by the relationship between enhanced working memory skills and grammatical comprehension. Finally, the narrative measures showed that the two groups produced a similar percentage of errors of global coherence and did not significantly differ on % of lexical informativeness. Notably, however, none of the bilinguals produced errors of global coherence or showed reduced lexical informativeness, whereas two monolinguals produced more repeated and filler utterances and fewer informative words. This was quite expected (see also Marini et al., 2019) as global coherence difficulties likely reflect challenges in planning and monitoring, which are often observed in individuals with conditions such as Williams syndrome or autism spectrum disorders (e.g., Ferretti et al., 2018; Marini et al., 2010). Overall, these results indicate that phonological, lexical and grammatical developments are not negatively affected by exposure to two languages, even in children with DLD, and that the bilingual exposure might even enhance specific linguistic skills.

The *second research question* examined the linguistic performance of bilingual children with DLD in both languages. On measures assessing expressive and receptive phonological skills (i.e., % phonological errors and phonological discrimination), participants showed similar performance in both languages. However, they performed worse in Slovenian (L2) than in Italian (L1) on tasks assessing lexical production and comprehension. This result might be related to a group bias. As noted in the participants section, Italian is the primary language of exposure for 53% of participants, which may have influenced the overall distribution of scores on tasks assessing lexical production and comprehension in Slovenian.

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Exposure plays an important role in vocabulary development, as shown in other studies on bilingual children (e.g., Thordardottir, 2011; Dicataldo & Roch, 2020). For example, in a large cohort of 111 Italian-speaking preschoolers, Dicataldo and Roch (2020) showed that variations in bilingual exposure significantly affect the development of not only vocabulary but also narrative comprehension skills and working memory. Nonetheless, regardless of exposure levels, all bilinguals attended schools where Slovenian is routinely used as the primary language of instruction, which may reduce the effect of exposure on lexical development. Interestingly, although bilinguals had similar grammatical production skills in both languages (as measured by the number of grammatically complete sentences on the narrative production task), they scored lower in Slovenian than in Italian on grammatical comprehension. At the same time, they performed better than monolinguals in their native language on this task, as described above. This may suggest a quality bias due to the distinct types of language used in home and school contexts. Vocabulary and grammar vary significantly between everyday use at home and academic use in school, which might strongly influence the development of both vocabulary and grammar. Overall, these findings suggest that exposure to two languages does not impair grammatical abilities in preschoolers with DLD. A lower performance in Slovenian might be an epiphenomenon of a poorer lexical repertoire in this language among many bilinguals. To control for this possibility, additional analyses did not find a significant correlation between bilinguals' scores on tasks assessing lexical comprehension and grammatical comprehension in either Slovenian ($r = .066$; $p = .816$) or Italian ($r = .322$; $p = .242$). Another possibility may lie in the grammatical characteristics of the two languages. In this regard, a qualitative inspection of the types of sentences included in the grammatical comprehension test in both Italian and Slovenian showed that bilinguals performed similarly across sentence types in the two languages (see Table 6). The difference in performance on the grammatical comprehension task among bilinguals may therefore lie in other aspects of morphosyntactic processing. Several investigations have shown that clinical markers of DLD may vary across languages, depending on their morphological and morphosyntactic organization (e.g., clitics in Italian, e.g., Vender et al., 2016; agreement in German, e.g., Rothweiler et al., 2012; inflection in Hebrew, e.g., Armon-Lotem, 2012). Certain aspects may be affected in one language but not in another, such as the formation of the past tense, which is impaired in English (Jacobson & Livert, 2010), but not in German (Clahsen et al., 2014). From a morphosyntactic point of view, Slovenian is a morphologically rich language, with three word classes subject to inflection (i.e., nouns, adjectives and verbs) that inflect for three grammatical genders (masculine, feminine and neutral) and three numbers (singular, plural and dual). Furthermore, nouns and adjectives inflect for six cases (nominative, genitive, dative, accusative, locative and instrumental) (Greenberg, 2006; Stegovec, 2022). This makes this language considerably more complex than Italian from a morphological and morphosyntactic perspective, which may have contributed to the language-related differences observed here. Previous investigations on Slovenian children with DLD suggest that major difficulties are often found in managing inflections (Grobler, 2002; Grobler & Arapović, 2007). To further investigate this aspect, we conducted a post hoc qualitative inspection of the morphological errors produced by the participants on the narrative production task. Specifically, we calculated the percentage of morphological errors by counting instances where bound inflective morphemes were misused (i.e., where Italian requires agreement in gender and number, while Slovenian requires agreement in gender, number and case) and dividing by the total number of words. This analysis confirmed that, although no group-related differences were found in Italian ($t_{(28)} = 1.256$; $p = .220$; $d = .459$), bilinguals produced significantly more errors of this kind in Slovenian ($t_{(14)} = 3.010$; $p < .009$; $d = .777$) (see also Table 6). These difficulties on the grammatical comprehension task were not tied to a specific type of sentence but were instead due to misunderstandings of case-related agreement relations between words. Interestingly, a similar language-dependent difficulty has been observed in the production of morphological errors among both typically developing children and those with DLD in German (Marini et al., 2019). The lack of difference in grammatical production among bilingual participants is likely due to their choice to use simpler syntactic structures while describing a cartoon picture story. For narrative measures, no language-related differences were found in the production of informative words or global coherence errors. As observed in Italian, global coherence errors in Slovenian consisted exclusively of repeated or filler utterances with the absence of tangential or semantically incongruent utterances. This further supports the hypothesis that the two languages are similarly processed at the macrolinguistic level.

The *third research question* examined the potential effect of bilingualism on updating and inhibitory skills in bilingual children with DLD. The bilingual participants demonstrated enhanced updating skills, reflected in significantly better performance on both the forward and backward digit recall task. Interestingly, the within-group analyses supported the hypothesis that this enhancement in phonological working memory skills was evident in both languages, with no difference in performance between Italian and Slovenian on either task. An enhancement in executive skills among bilinguals was also observed on both subtests of the inhibition task of the NEPSY-II (Urgesi et al., 2011), which assess participants' ability to monitor their performance and inhibit inappropriate responses. The analyses revealed that monolingual participants with DLD made significantly more errors than bilinguals with DLD on both versions of the test. This group-related difference was especially pronounced in the more complex section of the test, which required participants to not only name items but also inhibit automatic responses (i.e., Part B). In Part A, 66.6% of monolinguals with DLD showed good to excellent performance, while only five participants (33.3%) scored lower, resulting in an overall performance in line with normative data (z-score: 0.00). In Part B, the monolinguals showed a more varied performance: 46.7% of participants scored good to excellent, 40% scored average or below average, and 13.4% scored borderline or significantly below the expected mean. In contrast, 93% of bilinguals performed over 75% of the normative sample in both parts of the test, with average z-scores approximately 1 standard deviation above the expected mean. Overall, these results suggest that exposure to two languages in simultaneous bilinguals positively impacts updating, monitoring and inhibitory skills and that these effects are also observable in children with DLD. Indeed, in studies on bilingual children with typical development, EFs have been extensively investigated, suggesting that adequate exposure to two languages may enhance skills such as inhibition and sustained attention (e.g., Bialystok et al., 2012). It has been proposed that such enhancement may result from the constant activation of both languages within a bilingual's linguistic competence. This requires the bilingual to plan messages in the target language, continuously inhibit the non-target language and monitor this process throughout the interaction (e.g., the Inhibitory Control Model by Green, 1998; see also Poarch & Van Hell, 2012).

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The *fourth research question* focused on the potential relationship between measures of updating and inhibitory control and the two linguistic measures in Italian where bilinguals showed greater heterogeneity than monolinguals. These analyses support the hypothesis that cognitive processing is related to linguistic abilities. Specifically, in both groups phonological discrimination was found to be correlated with both inhibition and updating skills, while grammatical comprehension was correlated with updating only. The task of phonological discrimination requires the child to decide whether a pair of heard words – either minimal pairs or identical words – are different. This task involves not only phonological comprehension but also inhibitory control (i.e., the ability to inhibit the activation of semantically related words that do not start with the target phoneme) and metaphonological skills (i.e., making decisions based on phonological awareness). As such, it is cognitively demanding, requiring children to discriminate heard phonemes by paying close attention, locate target words in their mental lexicon within semantic memory, inhibit the activation of semantic or phonological competitors, retain these words in working memory until a decision is made, and finally provide the correct response by inhibiting any incorrect option. As can be seen by the breakdown of the cognitive processes underlying this decision, it does not surprise that scores on the phonological discrimination task correlated with measures of inhibitory control and phonological working memory in both groups. The relationship between phonological working memory and grammatical comprehension has recently been the target of debate, as findings have not always been consistent. For example, in a study of 51 monolingual children aged 6 to 12, Montgomery et al. (2008) did not find a significant relationship between memory and sentence comprehension. In contrast, a different study by Engel de Abreu et al. (2011), which included 109 bilingual children aged 6, reported that working memory had a significant impact on grammatical comprehension. More recently, Moscati et al. (2023) collected data from a large sample of 996 Italian-speaking children aged 4–10, specifically investigating the relationship between working memory measures (based on forward and backward digit recall tasks, as in the current study) and syntactic comprehension. The results showed that phonological working memory had a significant effect on syntactic comprehension. Consistent with these findings, our study supports the existence of a significant relationship between phonological working memory and the ability to understand sentences of varying syntactic complexity.

Despite the limitation of a small sample size per group and the absence of a monolingual DLD group exposed only to Slovenian, this study allows us to draw some theoretical and clinical conclusions about the cognitive and linguistic effects of bilingual exposure on children with DLD. From a theoretical point of view, this suggests that exposure to two languages does not negatively impact the linguistic development of children with DLD. Bilinguals not only performed on par with monolinguals with DLD on several linguistic tasks, but they also outperformed them on a grammatical comprehension task. Given that this performance correlated with phonological working memory in both groups, and considering that bilinguals had enhanced working memory skills – consistent with recent evidence from a large sample of Italian-speaking children (Moscati et al., 2023) – we might assume that a more efficient working memory system enabled better processing of syntactic information, which likely contributed to their superior performance on the grammatical comprehension task. This consideration leads to the clinical conclusion. From a clinical point of view, this study suggests the need to assess a child's two languages using tests that have been carefully adapted between them. Such adaptations allow clinicians to accurately compare bilingual performance across languages. Furthermore, the observed correlations between linguistic and cognitive measures can also inform clinical settings, particularly regarding rehabilitation practices and possible interactive effects when targeting one skill or the other. Future studies should further explore this potential, including larger cohorts of participants.

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Appendix A

Qualitative performance on language tasks in Italian

Qualitative performance of the two groups of participants with DLD. For each linguistic measure, the percentage of children scoring within a specific z-score is reported together with absolute numbers.

	Monolinguals with DLD	Bilinguals with DLD
% Phonological errors	0: 47% (N = 7) 1: 20% (N = 3) 1,5: 0% (N = 0) 2: 33% (N = 5)	0: 40% (N = 6) 1: 7% (N = 1) 1,5: 13% (N = 2) 2: 40% (N = 6)
Phonological discrimination*	−2: 0% (N = 0) −1,5: 0% (N = 0) −1: 0% (N = 0) 0: 73% (N = 11) 1: 27% (N = 4) 1,5: 0% (N = 0) 2: 0% (N = 0)	−2: 7% (N = 1) −1,5: 7% (N = 1) −1: 53% (N = 8) 0: 13% (N = 2) 1: 7% (N = 1) 1,5: 0% (N = 0) 2: 13% (N = 2)
Naming	−2: 13% (N = 2) −1,5: 0% (N = 0) −1: 13% (N = 2) 0: 47% (N = 7) 1: 7% (N = 1) 1,5: 13% (N = 2) 2: 7% (N = 1)	−2: 13% (N = 2) −1,5: 7% (N = 1) −1: 0% (N = 0) 0: 67% (N = 10) 1: 0% (N = 0) 1,5: 13% (N = 2) 2: 0% (N = 0)
Lexical comprehension	−2: 13% (N = 2) −1,5: 13% (N = 2) −1: 27% (N = 4) 0: 40% (N = 6) 1: 7% (N = 1) 1,5: 0% (N = 0) 2: 0% (N = 0)	−2: 7% (N = 1) −1,5: 0% (N = 0) −1: 13% (N = 2) 0: 47% (N = 7) 1: 13% (N = 2) 1,5: 20% (N = 3) 2: 0% (N = 0)
Grammatical comprehension*	−2: 13% (N = 2) −1,5: 13% (N = 2) −1: 40% (N = 6) 0: 27% (N = 4) 1: 7% (N = 1) 1,5: 0% (N = 0) 2: 0% (N = 0)	−2: 0% (N = 0) −1,5: 0% (N = 0) −1: 0% (N = 0) 0: 47% (N = 7) 1: 33% (N = 5) 1,5: 20% (N = 3) 2: 0% (N = 0)
% Complete sentences	−2: 0% (N = 0) −1,5: 20% (N = 3) −1: 20% (N = 3) 0: 60% (N = 9) 1: 0% (N = 0) 1,5: 0% (N = 0) 2: 0% (N = 0)	−2: 13% (N = 2) −1,5: 40% (N = 6) −1: 7% (N = 1) 0: 33% (N = 5) 1: 0% (N = 0) 1,5: 0% (N = 0) 2: 7% (N = 1)
% Errors of global coherence	0: 87% (N = 13) 1: 0% (N = 0) 1,5: 7% (N = 1) 2: 7% (N = 1)	0: 100% (N = 15) 1: 0% (N = 0) 1,5: 0% (N = 0) 2: 0% (N = 0)
% Lexical informativeness	−2: 0% (N = 0) −1,5: 13% (N = 2) −1: 7% (N = 1) 0: 67% (N = 10) 1: 13% (N = 2) 1,5: 0% (N = 0) 2: 0% (N = 0)	−2: 0% (N = 0) −1,5: 0% (N = 0) −1: 0% (N = 0) 0: 87% (N = 13) 1: 13% (N = 2) 1,5: 0% (N = 0) 2: 0% (N = 0)

Appendix B

Questionnaire to assess the exposure to a bilingual context

Child's ID_____.

General information

1. Interviewed parent:

   ☐ Mother _____ ☐ Father _____
2. Age (mother)* _____ Age (father)* _____
   (Please also indicate the age of the parent who did not complete the questionnaire)
3. Date of birth: _____

Socio-demographic information about the family unit

4. Number of people in the family unit:_____
5. Number of children:_____
6. What is your level of education?_____
7. What is your husband's/wife's or partner's level of education? _____
8. How many books do you have at home?

   ☐ None ☐ 1–20 ☐ 21–40 ☐ 41–60 ☐61–80 ☐ more; approximately, how many?___.

Language exposure

9. At home, you speak to each other using:
   ☐ Italian ☐ Slovenian ☐ Both languages
10. Which language(s) do you use with the child?
    ☐ Italian ☐ Slovenian ☐ Both languages
11. At home, besides Italian and Slovenian, do you speak any other languages? ☐ YES ☐ NO

    If YES, which ones?
    a. _____
    b. _____
    c. _____
12. **Language use within the family**:

	Italian	Slovenian	Other languages
(Check more than one box if applicable)			
a) The father speaks to the child in:	☐	☐	☐
b) The child responds to the father in:	☐	☐	☐
c) The mother speaks to the child in:	☐	☐	☐
d) The child responds to the mother in:	☐	☐	☐
e) The child speaks with his/her siblings in:	☐	☐	☐

13. **The language to which the child is currently most exposed is**
    ☐ Italian ☐ Slovenian

    (Check more than one box if applicable).
    ☐ Other (please, specify) _____.
14. **Your child's mother tongue is: ☐ Italian ☐ Slovenian**

    (Check more than one box if applicable).
    ☐ Other (please, specify) _____.

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15. **How do you perceive your child's bilingualism?**

☐ My child understands and speaks only his/her mother tongue.
☐ My child speaks only his/her mother tongue but understands everything that is said to him/her in _____.
☐ My child uses both languages; however, his/her mother tongue is definitely the dominant language.
☐ My child uses both languages equally.

16. **Over the course of a typical day, what percentage of time does a child spend being exposed to**

Italian _____ %.
Slovenian _____%.
Other language(s) _____ %.

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