Costly sentences, inhibitory control, and narrative abilities: an assessment with MAIN of Brazilian Portuguese-speaking children at risk of DLD

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This study investigates whether children's comprehension of costly syntactic structures, such as passives and relative clauses are linked to their performance in narrative tasks. It also explores possible correlations between linguistic, narrative and inhibitory control (IC) measures. Two groups of children speaking Brazilian Portuguese (BP) (mean age: 8;3) were tested: typically-developing children (TD) and children at risk of Developmental Language Disorder (DLD). A standardized linguistic assessment battery for BP (MABILIN) was used together with the BP version of MAIN, and two non-verbal IC tasks adapted for children (Flanker and Go/no-go). Significant group differences were observed for most of MAIN's measures of narrative macrostructure. Additionally, significant correlations were found between the number of correct responses in the syntactic battery and macrostructure in MAIN, particularly story structure and story comprehension. Correlations between MABILIN and the Flanker test were also obtained. These findings suggest that linguistic difficulties at the discourse level can be expected for children with DLD. Correlations between MABILIN and the Flanker test indicate that resistance to interference, a form of sustained attention, is required in the comprehension of syntactically costly sentences in a picture selection task.

1 Introduction

Developmental Language Disorder (DLD) is a neurodevelopmental disorder that affects 7–8.5% of school children worldwide (Auza et al., 2024; Calder et al., 2022; Tomblin et al.,1997; Norbury et al., 2016; Pham et al. 2019; Wu et al., 2023). The term DLD has recently replaced the widely used term SLI (Specific Language Impairment) as the result of a consensus in the CATALISE Consortium (Bishop et al., 2016, 2017).[1] DLD refers to a language disorder not associated with a known biomedical aetiology.[2] The symptoms of DLD are rather heterogenous, though difficulties in the syntactic and morphological domains characterize it (Leonard, 2014; Conti-Ramsden, Crutchley & Botting, 1997; Friedmann & Novogrodsky, 2008). Children with DLD have been shown to have difficulty comprehending syntactically costly structures (Contemori & Garraffa, 2010; Friedmann & Novogrodsky, 2008; Frizelle & Fletcher, 2015; Georgiou & Theodorou, 2023; Stavrakaki, 2001, Van der Lely & Battell, 2003), namely structures which involve more complex syntactic operations for their formation/generation. Regarding narrative abilities, children with DLD also show poorer performance than typically developing (TD) children, both in the macrostructure, i.e., the ability to produce a coherent, highly structured narrative, and the microstructure, i.e., the ability to produce a cohesive narrative, (Fey et al., 2004; Befi-Lopes et al., 2008; Blom & Boerma, 2016; Vaz, Lobo & Lousada, 2022). Although their narrative skills develop during childhood, their performance is below age-matched pairs, even in recall tasks (Reuterskiöld et al., 2011; Kraljevic et al., 2020; Favot et al., 2020).

Recent studies have identified correlations between the development of executive functions and language performance, encompassing both linguistic measures and narrative skills in children with typical and atypical language development (Kaushanskaya et al., 2017; Marini et al., 2020; Scionti et al. 2023). Executive functions include inhibitory control, working memory, and cognitive flexibility (Diamond, 2013; Miyake et al., 2000). The present study aims to examine whether children's ability to comprehend syntactically complex sentences predicts their performance in narrative comprehension, production, and recall. Additionally, it explores potential correlations between linguistic and narrative abilities and executive functions, more specifically, inhibitory control skills.

1.1 Costly sentences

According to generativist theory (Chomsky, 1995), costly sentences are those whose derivation involves a movement operation, that is, when an element appears in a position different from the one in which it is semantically interpreted, as in passive sentences (A-movement) (1), relative clauses (RCs) (2a, b), and WH-interrogatives (A-bar movement) (3a-d). In these

[1] The CATALISE consortium is a multinational and multidisciplinary study focused on identifying and defining language impairments in children. It utilized the Delphi method, an iterative process involving a panel of experts who rate statements and provide feedback, to reach a consensus.

[2] Biomedical conditions include: "brain injury, acquired epileptic aphasia in childhood, certain neurodegenerative conditions, cerebral palsy and oral language limitations associated with sensori-neural hearing loss (Tomblin et al., 2015) as well as genetic conditions such as Down syndrome […] autism spectrum disorder (ASD) and/or intellectual disability" (Bishop et al., 2017, p. 1071).

contexts, the element in question is said to be dislocated from its base position (where it is semantically required/interpreted) to the position in which it is phonologically realised (the subject position in passive sentences or the leftmost position in relatives and WH sentences).

(1) The boy was called __by the teacher.

(2) a) …the boy who __ called the teacher…

b) …he boy who the teacher called ___…

(3) a) Who __ called the teacher?

b) Who the teacher called __?

c) Which boy ___called the teacher?

d) Which boy did the teacher called __?

The asymmetry between subject (2a) and object (2b) RCs – the latter being the most demanding one – is widely attested in adults' and children's performance across different languages, and several proposals have been put forward to account for it (Lau & Tanaka, 2021). This asymmetry can also be observed in WH-interrogatives (3), though it is particularly noticeable in object Which-questions (3d), which are more demanding than object Who-questions (3b) (Augusto & Correa, 2023). In object Which-questions (3d), as in object RCs (2b), there is an intervening element (the subject of the RC or the interrogative sentence) between the left-most element and its original (object) position (the position in which the thematic role of patient/theme is assigned). In this context, an effect of featural intervention (Grillo, 2009; Friedmann, Belletti & Rizzi, 2009) or an effect of retrieval and/or encoding interference (Lewis & Vasishth, 2005; Van Dyke & McElree, 2006; Villata et al., 2018) would explain the greater demands.

Children with DLD have particular difficulty comprehending these costly sentences (for a scoping review, see Georgiou & Theodorou, 2023). The cause of this difficulty is still unclear. It has been ascribed to syntactic deficit, and working memory limitations (Montgomery, 2002; Van der Lely & Battell, 2003; Jakubowicz, 2011; Archibald, 2018). In the present study, children's comprehension of costly structures was evaluated by means of a standardized linguistic assessment battery for Brazilian Portuguese (BP) (MABILIN),[3] aimed at identifying children with syntactic impairment.

[3] MABILIN (Módulos de Avaliação de Habilidades Linguísticas) consists of a syntactic, a morphosyntactic, and a grammar-pragmatic module developed in LAPAL by the last author. The syntactic module is available on-line https://mabilin.biobd.inf.puc-rio.br/

1.2 Narrative skills

Narratives are the first extended discourse type developed by children (Westby, 1984) and have been used to evaluate fundamental discourse skills. Narrative texts can be either real or imaginary; they generally introduce an initial event that triggers the narrative itself, followed by a complication that causes a set of events or problems, the resolution, and the outcome (Adam, 1982). They can contain one type of text or several. For example, the same narrative text can include descriptive, dialogic, explanatory, or argumentative excerpts, which will directly influence the text's difficulty. That is, the greater the insertion of extra excerpts in the narrative, the greater the reader's difficulty in encoding and interpreting this text.

Narratives can be analyzed at macrostructure and microstructure levels (Liles et al., 1995). The macrostructure represents the story's thematic organisation, in which episodes are causally or temporally related (van Dijk, 1980). At the macrostructural level, there is the presentation of the initial situation of the story, the temporal and spatial location, the introduction of characters, the main stages of the development of the plot (the conflict, the climax, and the resolution, with the impact that it causes in the outcome of the story) (Beaugrande & Dressler, 1983). Therefore, all the general aspects that support the organization/coherence of the story are contained at this level. In contrast, the microstructure of a narrative plays a role in the use of a set of linguistic elements, such as lexical items, morphological and syntactic structures, necessary for characterisation of the characters, the presentation of the events and of the context in which they occur, in the development of the narrative. These microlevel elements reflect the cohesion of the text as a whole (Halliday & Hasan, 1976). At this level, aspects such as the variety of lexical items, the productivity and complexity of syntactic structures, the semantic relationships established among the narrated events, and the number of ungrammatical clauses used can all be analyzed.

The narrative production of children with DLD has been shown to be poorer than the production of TD children at the macrostructure level (Fey et al., 2004; Mäkinen et al., 2014; Norbury et al., 2014), though there is some controversy in this regard (Dodwell & Bavin, 2008; Tsimpli, Peristeri & Andreou, 2016), possibly due to methodological differences (Govindarajan & Paradis, 2022). Studies conducted with Portuguese-speaking children pointed out less detailed or precise characterisation of the characters, fewer complete or more incomplete episodes, and poor coherence in the narratives of DLD children, apart from differences in the microstructure level, which contributed to their overall poorer performance, such as the predominance of simple sentences and even the occurrence of agrammatical structures (Befi-Lopes et al., 2008; Vaz, Lobo & Lousada, 2022).

A more systematic analysis of children's narrative abilities across different languages has been provided by the use of the Multilingual Assessment Instrument for Narrative (MAIN; Gagarina et al., 2019). MAIN was developed by an interdisciplinary group of researchers within the framework of COST Action IS0804 as an instrument suitable for assessing children's narrative abilities, especially those of bilinguals. MAIN provides a protocol for measuring microstructure and macrostructure skills in both comprehension and production, as well as the production of internal state terms. It has been intended to assess narratives in both languages of

bilingual children, to identify children at risk for DLD, and has been widely used across different languages (Lindgren et al., 2023).

In a study conducted with Mandarin-speaking children, for instance, children at risk of DLD performed worse than the matched control children, considering both macrostructure scores and sentence complexity, and both groups had better performance in the retelling than in the telling tasks (Sheng et al., 2020). In Pham et al. (2019), MAIN was used to screen for DLD in Vietnamese children. They found that performance on vocabulary tasks was moderately to strongly related to sentence-level performance, while storytelling was correlated with the following linguistic measures: expressive and receptive vocabulary, mean length of utterances (MLU), grammaticality and subordination index. In a study conducted in Croatian comparing DLD and typically developing six-year-olds (Kraljević et al., 2020), a group effect and an elicitation mode effect were obtained; children with DLD had poorer performance than children with TD, and both groups had higher scores in the retelling condition. A two-phase study with Dutch-speaking children distributed in DLD and control (5–6-year-olds at the first assessment; 6–7-year-olds at the second one) was mainly concerned with the effect of language disorder at the macrostructural level (Blom & Boerma, 2016). In this study, the performance of the DLD group was poorer than the TD group at both narrative production assessments, but the magnitude of the effect became smaller with age. In comprehension, the performance of the TD group was better than the DLD group only at the first assessment. Correlations were obtained between macrostructure (comprehension and production tasks) and several linguistic (vocabulary, grammar) and cognitive measures (verbal memory, sustained attention) in the two groups, at both assessments, suggesting that cognitive factors and linguistic abilities contribute to children's performance on narratives at a macrostructure level. However, based on a mediation analysis aimed to detect causal relation between the impairment status (independent variable) and story generation (dependent variable), with sustained attention as the mediator variable, the authors conclude that sustained attention – the ability to keep focused on the task (a cognitive mediator variable) is a predictor of macrostructure outcomes in the production tasks, as it was weaker in the DLD than in the TD group.

Many recent studies have explored the relationship between linguistic, narrative, and cognitive skills in children. There is evidence of the role of cognitive measures in the development of oral language in both DLD and typically language-developing children (Woodard, Pozzan & Trueswell, 2016; Henry, Messer & Nash, 2012; Lukács et al., 2016; Ullman & Pierpont, 2005). This study contributes to this endeavour by presenting results from child speakers of Brazilian-Portuguese, correlating linguistic abilities (particularly the domain of more complex structures), narrative skills, and performance in inhibitory control tasks, one of the components of the executive functions (EFs).

1.3 Executive functions and linguistic abilities

"Executive functions" (EF) is an umbrella term for several cognitive processes related to thought and behaviour control (Diamond, 2013; Miyake et al., 2000). Inhibition, working memory, and cognitive flexibility are the core components of executive functions (Diamond, 2013). Recent studies have established correlations between EF skills and language

performance, measured on cognitive and linguistic tests, respectively. The linguistic tests assessed receptive and expressive language.

Kaushanskaya et al. (2017) investigated the relationship between nonverbal EF skills and language performance in typically developing English-speaking children (ages 8–11). They assessed inhibition, working memory (updating), and task shifting. Their findings showed that nonverbal working memory (updating) was associated with receptive language, while inhibition predicted children's syntactic abilities.

Marini et al. (2020) examined executive functions (updating and inhibitory control) alongside linguistic (articulatory and phonological discrimination skills, lexical production/comprehension, grammatical production/comprehension) and narrative abilities (discourse organisation and lexical informativeness) in Italian-speaking preschoolers with DLD and their TD peers. The DLD group showed weaker performance in executive function tasks and narrative skills, with moderate to strong positive correlations between the digit span recall and linguistic measures (articulation, phonological discrimination, and grammatical comprehension) as well as with narrative skills (lexical informativeness). Significant negative correlations were found between the inhibition task and linguistic measures such as phonological discrimination, grammatical comprehension, percentage complete sentences, as well as narrative skills such as lexical informativeness.

Everaert et al. (2023) reported significantly lower scores for the DLD group in all the non-verbal EF tasks used in the study (a visual selective attention task, a visuospatial short-term and working memory task, and a task gauging broad EF abilities), as well as in the language tests (vocabulary and morphosyntax). Children with DLD were outperformed by the TD group on all nonverbal EF tasks. These tasks were significantly correlated to morphosyntax in both TD children and children with DLD, but they were correlated to vocabulary only in the TD group.

A recent meta-analysis study (Scionti et al. 2023) aimed to explore the relationship between EFs and a multi-componential aspect of narrative competence (oral, written, micro and macrostructure levels), over development. They investigated how different EF skills (inhibition, working memory, flexibility, planning) relate to various aspects of narrative competence. A total of 30 studies with 285 effect sizes were analysed. There was a weak correlation between EFs and narrative competence measures, which decreased with age. The association between EFs and narrative skills were stronger in children with atypical development. In typical development, this relationship tends to weaken over development, with those cognitive and narrative abilities becoming more independent after the age of seven.

1.4 Aim of the study and research questions

The present research aims to verify whether children's ability to comprehend syntactically costly sentences can predict their performance in comprehending, producing, and recalling narratives. It also explores possible correlations between linguistic and narrative abilities and inhibitory control skills.

Assessing children's ability to comprehend costly structures contributes to the screening of DLD (Novogrodsky & Friedmann, 2009). However, it is unclear whether such an assessment

can predict children's performance in comprehending and recalling narratives. It is also unclear the extent to which the comprehension of costly structures and narrative abilities are related to inhibitory control skills. It has been argued that the relation between DLD and narrative skills is mediated by sustained attention (Blom & Boerma, 2016), which involves resistance to interference. It is our contention that the comprehension of costly sentences in a decision task crucially depends on focused attention by children as well.

A systematic analysis showed that oral narrative interventions may improve the narrative abilities of children with language impairment (Favot et al., 2020). Nevertheless, the possible role of children's linguistic ability at the sentence level on their narrative skills has not been explored so far. In the present study, the syntactic abilities of Brazilian Portuguese-speaking school children were assessed using a battery of tests (MABILIN) that focused on the comprehension of passive sentences, relative clauses and WH-questions in a picture-identification task. Possible correlations between these linguistic measures, narrative skills, and children's scores in inhibitory control tasks are explored. This opens up the possibility of sentence-level intervention procedures contributing to the development of discourse-level abilities. Our research questions are:

(1) Does the ability to comprehend linguistic skills/costly structures correlate with narrative skills in children at risk of DLD?
(2) Are there correlations between linguistic measures and measures of narrative macrostructure?
(3) Are there correlations between linguistic and inhibitory control measures?
(4) Are there correlations between narrative macrostructure and inhibitory control measures?

2 Methods

2.1 Participants

The data were obtained from a sample of 205 Brazilian Portuguese (BP) public school children in Rio de Janeiro, to whom the linguistic assessment instrument – MABILIN – was adminstered. It provided the means of distinguishing children at risk of DLD from those typically developing. Twelve children were identified as at risk of DLD (3 girls, 7;2–9;5; mean age: 8;3). Another 12 children of the same age range without difficulty in MABILIN were randomly selected from the same sample, constituting the control group of children with TD (4 girls, 7;8–9;4; mean age: 8;4). The 24 participating children were further assessed for their narrative skills, using MAIN (Gagarina et al., 2019).

2.2 Materials

2.2.1 MABILIN

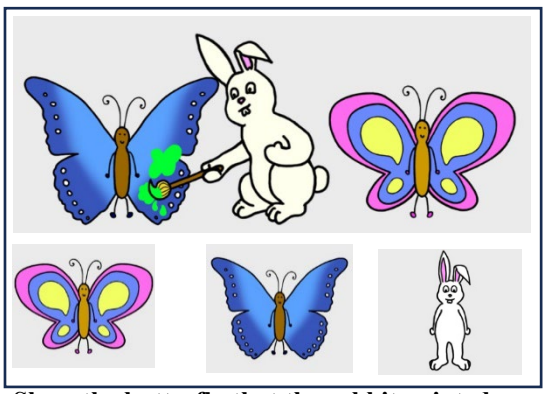
The syntactic module of MABILIN is an instrument, originally conceived in BP, standardised with almost 300 children (Correa, 2012), which has been used in several studies since then (Augusto & Correa, 2023; Correa, 2020; Correa & Augusto, 2021; Correa, Augusto & Bagetti, 2013; Rodrigues et al., 2024; Vicente, 2024). This battery was also adapted to Rioplatense

Spanish (Dotti et al, 2018). It focuses on the comprehension of costly sentences employing a picture identification task. It consists of three blocks. The first block presents active and passive sentences; the second block, right-branching relative clauses, Who-questions and Which-questions; and the third block, centre-embedded relative clauses with intransitive and transitive verbs in the main clause. A pre-test guarantees that the task is understood. The active sentences in block 1 constitute the baseline. The costly sentences, as defined in section 1, are presented in low and high-demand conditions, respectively: irreversible passives (in which a [- animate] subject makes it impossible for the agent role to be applied to it) (5); reversible passives (with reversible thematic roles) (6); subject and object right-branching relative clauses (7-8); subject and object WH-questions (who-questions (9-10); which-questions (11-12)); subject and object centre-embedded relative clauses with intransitive (13-14) and transitive verbs (15-16); subject and object centre-embedded relative clauses, with an intransitive main clause verb (13-14), and with a transitive main clause verb (15-16). There are a total of 13 conditions, with each condition having eight trials.

(4) *A maça foi comida pela formiga*.
'The apple was eaten by the ant'.
(5) *O elefante foi lavado pelo macaco*.
'The elephant was washed by the monkey'.
(6) *Mostra a tartaruga que limpou o macaco*.
'Show the turtle that cleaned the monkey'.
(7) *Mostra a borboleta que o coelho pintou*.
'Show the butterfly that the rabbit painted'.
(8) *Quem segurou o leão*?
'Who held the lion'?
(9) *Quem o porco chamou*?
'Who called the pig'?
(10) *Que urso puxou o leão*?
'Which bear pulled the lion'?
(11) *Que borboleta a abelha molhou*?
'Which butterfly did the bee wet'?
(12) *A tartaruga que molhou a zebra chorou*.
'The turtle that wet the zebra cried'.
(13) *O elefante que o tigre lavou dormiu*.
'The elephant that the tiger washed fell asleep'.
(14) *O porco que chamou o leão cortou o pão*.
'The pig that called the lion cut the bread'.
(15) *O coelho que o cachorro pegou derrubou a cerca*.
'The rabbit that the dog caught knocked down the fence'.

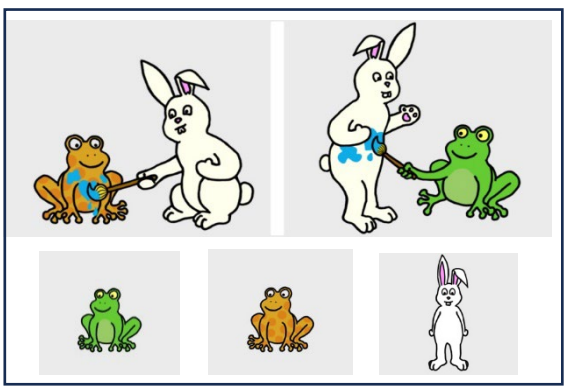
The visual material provides a background context with two tokens of the same type for the critical referent, enabling the felicitous use and interpretation of restrictive RCs and WH-questions, as argued in Correa (1995). The background image type (simple and complex) is counterbalanced for an overall assessment of the effect of the syntactic variables, and the effect

of the image complexity can be tested separately (Correa et al., 2022; Rodrigues et al., 2024). As illustrated in Figure 1, in the simple image condition, only one of the two characters of the same type is the actor or the patient in the background event. In the complex image condition (Figure 2), the two characters of the same type are involved in different events with reversed roles. Children are requested to point to one of the three images at the bottom of the screen, and the type of error can be analysed.[4]



Show the butterfly that the rabbit painted.

Figure 1. Right-branching object relative clause in the simple image condition.



Show the frog that the rabbit painted

Figure 2. Right-branching object relative clause in the complex image condition.

2.2.2 MAIN

The Brazilian Portuguese version of MAIN (Cunha de Aguiar & Martins dos Reis, 2020, Gagarina et al., 2019) was used in the present study. MAIN comprises four parallel picture-based stories (*Cat*, *Dog*, *Baby Birds*, *Baby Goats*), each containing six pictures. Three modes of elicitation are possible: telling, retelling, and telling after listening to a model story. In this assessment, two stories were used for the two elicitation procedures – telling and retelling: *Dog* and *Baby Goats*.[5]

2.2.3 Flanker and Go/no-go tasks

This study used versions of two Inhibitory Control tasks: the Flanker and Go/no-go tests, adapted to children and developed in the *Psytoolkit* experiment library (Rodrigues et al., 2024). Inhibitory Control tasks evaluate participants' ability to inhibit conflicting but irrelevant information. The Flanker test, originally described by Eriksen & Eriksen (1974), is intended to assess resistance to interference, whereas the Go/no-go test, developed by neuropsychologist Alexander Luria in the 1940–50s, evaluates response inhibition. To maintain engagement, both

[4] The incorrect choices are categorised as type 1 and type 2 errors, to be subsequently analysed. For instance, given a sentence such as the one in Figure 1, the type 1 error corresponds to choice of the non-target butterfly. In Figure 2, it corresponds to the non-target frog, suggesting that the information in the RC was not processed. Error type 2 is the choice of the rabbit in both figures, suggesting that children retrieved the most recent nominal element heard. The pattern of the errors can be informative to the kind of difficulty children face.

[5] The complete MAIN, including the pictures for the different stories, is available (after registration) from https://main.leibniz-zas.de/en/main-materials/main-materials/.

tasks were structured as a game where participants had to complete a specific objective. Each task included a training phase that provided feedback on response speed and accuracy. During the experimental phase, no feedback was given to the participants.

The Flanker task was designed as "the game of the fish family" (Rodrigues et al., 2024). There are three different situations: a neutral one, in which the leader fish (the fish in the middle) swims alone and the rest of the family are replaced by sea plants in the same position; a congruent one, in which all the family members swim in the same direction; an incongruent situation, the more challenging for the children, where the leader fish swims in the opposite direction of the rest of the group. Incongruent trials made up 25% of the total trials. The task consists of pressing, as quickly as possible, one of two keys on a computer keyboard (i.e., left vs. right) to indicate the direction of the middle fish. Figure 3 illustrates the three image possibilities: neutral, congruent, and incongruent.

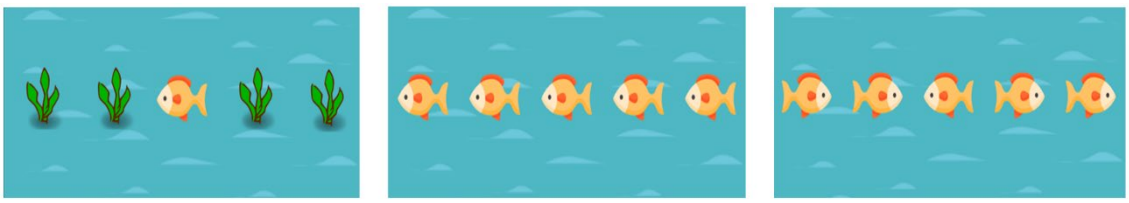


Figure 3. Images in Flanker for neutral, congruent, and incongruent conditions.

The Go/no-go task was also a simulation of a computer game. Participants are instructed to press a button when they saw a "go" signal and not respond when they saw a "no-go" signal. In this version, some toys are displayed: a small car, a teddy bear, a beach bucket, and a ball. All toys except the ball were "go" signals. Figure 4 shows the commands given to the children.[6]

Figure 4. Original instructions for the Go/no-go task.

2.3 Procedure

All tests took place in a quiet room of a public school in Rio de Janeiro over two or three sessions. MABILIN was the first instrument applied. If children were not tired, the inhibitory control (IC) tasks were also applied. A notebook with the programs installed was used to

[6] The instructions are the following: The game is as follows: Pedro is a very messy boy, and his mother always asks him to put away the toys he is not going to use. Among his favourite toys are a toy car, a teddy bear, a small bucket, and a colourful ball. Today, Pedro decided to play with his ball. You must help him put away the other toys. To do this, you should press the space bar on your computer keyboard. But remember: Pedro wants to play with the ball. So, when the ball appears, you must not press the space bar.

administer both the linguistic and the IC tasks. A subsequent session was dedicated to the MAIN protocol, for which a tablet was used.

2.3.1 MABILIN

Children were invited to play a game on the computer screen. They were told they would see some pictures and had to point to the picture that matched what the experimenter said. No children failed the pre-test. The three blocks were presented sequentially, with the test sentences randomized within each block. The whole session took about 20 minutes.

2.3.2 MAIN

A tablet was used to present the PowerPoint sequence and images for MAIN. At first, a character who was "super excited to hear you/us telling a story" was introduced. For the story telling task, the child chose an envelope out of three to see the pictures of the story. The whole sequence of six pictures was displayed. Then, the experimenter asked if the child was ready to tell the story. The two first pictures were shown, and the child was encouraged to start telling "the best story he/she can tell". When s/he finished discussing the first two pictures, the next slide was shown, and pictures 3 and 4 joined the first two. The process was repeated for pictures 5 and 6. When the child finished, s/he was praised for the story told, and the 10 comprehension questions were asked. For the retelling task, the experimenter then invited the child to choose a new envelope with a new story. At this time, the child was told that the experimenter would first tell a story that the child must then retell. In the end, the 10 narrative comprehension questions were asked. The order of the presentation of the telling and retelling tasks was counterbalanced across participants. The whole session took about 25 minutes. The session was recorded for transcription and analysis.

2.3.3 Inhibitory Control tasks: Flanker and Go-no go

For the inhibitory tasks, the child sat in front of the laptop and was invited to play a computer game. The instruction given to the child was that s/he should press certain keys on the keyboard according to each game. For the Flanker task, the S and L keys should be pressed if the leader fish was swimming to the left or the right, respectively. In Go/no-go, the space bar was used to store the toys, except for the ball, when no key should be pressed. Both tasks took about 10 minutes.

2.4 Coding and Analyses

The statistical analyses were carried out using the JASP 0.18.1.0 statistical software.

2.4.1 Linguistic skills: MABILIN

The test uses a Java program that provides the number of correct responses and errors. The number of correct responses obtained in each condition is automatically compared with the mean correct responses obtained with typically developing children in the same age group in the standardisation of the test (Correa, 2012). Children whose responses are 2 SD below the

mean in at least two conditions out of the total 13 conditions tested are identified as at risk of DLD, and the degree of difficulty (moderate, expressive, and severe) is characterised based on the number of conditions where the child's performance is 2 SD below the mean. The total number of correct answers per condition and the total number of correct answers in the test are also provided. As previously mentioned, the 12 children composing the group at risk of DLD were identified by MABILIN as showing a moderate risk. Twelve other children, identified as not showing difficulties, were paired by age and sex with the DLD group, forming the TD group.

2.4.2 Narrative skills: MAIN

The MAIN protocol scores macrostructure and microstructure elements in the narratives (Gagarina et al., 2019). For *Story Structure* and *Story Complexity*, single elements, such as internal states (IS), Goals (G), Attempts (A), and Outcomes (O), are examined. These elements form episodes. There are three episodes in each story. For the *Story structure* score a maximum of 17 points can be awarded, for the production of a setting (time + place, max=2), and IS as an initiating event, goal, attempt, outcome, and IS as the reaction in each of the three episodes (max=15 points, 3x5 components). *Story complexity* was measured by the ability to combine the elements G, A, and O, forming complete episodes, i.e., GAO-sequences (max=3 for the total story). The number of *Internal State Terms* (IS) was also counted. *Story Comprehension* is assessed with 10 questions (Max = 10). Three questions pertain to the understanding of the three goals, six questions target the characters' internal states, and one question assesses the understanding of the entire plotline.

The MAIN protocol also offers some guidance on measuring the narrative microstructure. Regarding narrative length and lexis, we considered the total number of types and tokens and the *type/token ratio*. We also present the 12 most frequent words used in each group for either telling or retelling, for which we used the ANTCONC program (version 4.2.4) (Anthony, 2023). Regarding syntax complexity, the distribution of *types of sentences* – simple main clauses, coordinating and subordinating constructions for each story produced - was also quantified. That is, considering all the clauses produced, the percentage of each type of sentence was calculated: simple main clauses (16), coordinated clauses (17), and subordinate clauses (18).

(16) *Um dia, um cachorro bem alegre viu um rato*.
"One day a very happy dog saw a mouse".

(17) *... deixou a sacola, uma sacolinha no chão* ***e foi vê o balão***.
"…left the bag, a small bag on the floor **and went to see the balloon**".

(18) *ele não vai se importar* ***se eu comer algumas salsichinhas***.
"he won't mind **if I eat some little sausages**".

The performance of both groups in all these measures was submitted to non-parametric tests. Comparisons within the group, contrasting the performances in the telling and retelling modes, were statistically analysed using the Wilcoxon non-parametric test. Comparisons between groups were statistically analysed using the Mann-Whitney non-parametric test.

2.4.3 Inhibitory Control tasks

The Inhibitory Control tasks (IC) tasks inform the child's answer and response time for each trial. For the Flanker task, we considered the total number of correct responses and the general response time, and also the number of correct responses and response time for the incongruent condition, which is the most challenging for the children. For the Go-no go task, we considered total accuracy, no-go responses, and reaction time. The performance of both groups in all these measures was compared using Mann-Whitney statistical analyses.

2.4.4 Correlations

Additionally, correlation analyses were also performed. Since the data was not normally distributed, we ran the Spearman correlation test. We considered MABILIN's total correct responses and the MAIN measures for macrostructure for both telling and retelling modes of elicitation. We also correlated these measures with the Flanker and Go-no-go tasks for correct responses and response time.

3 Results

3.1 MABILIN

The total score of correct responses measured linguistic abilities for the present purposes, with a maximum score of 104. Table 1 presents the descriptive statistics.

Table 1. Correct responses in MABILIN per group.

	DLD	**TD**
Mean	79.6	93.1
SD	5.9	5.4
Median	81	92
Min	69	86
Max	87	104

A significant difference between the groups was obtained in the independent sample Mann-Whitney test ($U = 2$, critical value of $U = 37$, $z = -4.01$, $p < .001$), with the group at risk of DLD showing more difficulty.

3.2 MAIN

As far as the macrostructure is concerned, the comparison of both groups in *story structure* (max score=17) revealed a lower performance of the group at risk of DLD compared to the TD, for both telling and retelling modes (telling: $Mdn_{DLD} = 7$; $Mdn_{TD} = 9$; retelling: $Mdn_{DLD} = 9$; $Mdn_{TD} = 12$). Nevertheless, both groups showed better performance in the retelling mode. Mann-Whitney tests showed a statistically significant difference between groups in both elicitation procedures (telling: $U = 27.5$, critical value of $U = 37$, $z = -2.54$, $p = .01$; retelling: $U = 22.5$, critical value of $U = 37$, $z = -2.82$, $p = .01$). Wilcoxon tests showed that the effect of elicitation procedure was significant only for the TD group (TD: $z = -2.04$, $p = .04$; DLD: $z =$

-1.78, p = .08), suggesting that the group at risk of DLD did not benefit from the model story presented by the examiner in the retelling mode, while the TD group did, as shown in Table 2.

Table 2. Descriptive statistics for story structure in MAIN.

	DLD		**TD**	
	Telling	Retelling	Telling	Retelling
Mean	6.9	8.6	9.4	11.6
SD	1.8	2.6	2.0	1.9
Median	7	9	9	12
Min	4	5	7	7
Max	10	14	13	14

Descriptive statistics for *story complexity*, that is, the production of GAO-sequences are presented in Table 3. The maximum score is 3, as there are three episodes in each story. Very few children produced GAO-sequences (telling: $Mdn_{DLD} = 0$; $Mdn_{TD} = 1$; retelling: $Mdn_{DLD} = 0$; $Mdn_{TD} = 2$). There was a statistically significant difference between the groups in the retelling mode (U = 33.5; critical value of U = 37, z = -2.19, p = .02), but not for the telling mode (U = 44, critical value of U = 37, z = -1.58, p = .11).

Table 3. Descriptive statistics for the production of GAO-sequences.

	DLD		**TD**	
	Telling	Retelling	Telling	Retelling
Mean	0.3	0.6	0.8	1.6
SD	0.6	1.0	0.8	1.0
Median	0	0	1	2
Min	0	0	0	0
Max	2	3	3	3

Table 4 shows descriptive statistics for the production of internal state terms.

Table 4. Descriptive statistics for the production of internal state terms.

	DLD		**TD**	
	Telling	Retelling	Telling	Retelling
Mean	1.9	2.5	2.5	4.5
SD	1.6	1.4	0.9	1.6
Median	2	2.5	3	4.5
Min	0	0	1	2
Max	6	5	4	8

A similar picture emerged regarding the use of internal state terms (IS (telling: $Mdn_{DLD} = 2$; $Mdn_{TD} = 3$; retelling: $Mdn_{DLD} = 2.5$; $Mdn_{TD} = 4.5$). A statistically significant difference between the groups was also obtained for the retelling mode (U = 24.5, critical value of U = 37, z = -2.71, p =.01). Once again, TD group benefited from the model story presented by the examiner in the retelling mode, while the group at risk of DLD did not.

Finally, we analyzed the children's story comprehension (Table 5). There were relatively high scores for both groups in both elicitation modes (telling: DLD_{mean} = 8.1; TD_{mean} = 9.2; retelling: DLD_{mean} = 8.3; TD_{mean} = 9.4). No statistical differences were obtained ($\chi^2(3) = 4.68$, $p < .19$).

Table 5. Descriptive statistics for comprehension assessment in MAIN.

	DLD		**TD**	
	Telling	Retelling	Telling	Retelling
Mean	8.1	8.3	9.2	9.4
SD	1.8	2.0	0.8	1.1
Median	8	9	9,5	10
Min	3	4	8	6
Max	10	10	10	10

Table 6 presents descriptive statistics for the Type-Token Ratio (TTR), one of the investigated microstructure measures. No statistically significant differences were found between groups, neither for telling (U = 283, critical value of U = 288, z = 0.09, p = .92) nor for retelling (U = 280.5, critical value of U = 288, z = 0.14, p = .88).

Table 6. Descriptive statistics for TTR in MAIN both for Telling and Retelling conditions across DLD and TD group.

	DLD		**TD**	
	Telling	Retelling	Telling	Retelling
Mean	0.5	0.5	0.5	0.5
SD	0.1	0.1	0.1	0.1
Median	0.5	0.4	0.5	0.5
Min	0.4	0.3	0.4	0.3
Max	0.6	0.6	0.7	0.6

In Table 7, we present the 12 most frequent words for each group in the two elicitation modes. Articles, prepositions, and pronouns were very frequent in both groups, but it is noticeable that: i) there were more lexical words within the twelve most frequent words in the group at risk of DLD; ii) there were more occurrences of the discourse marker *aí* 'then' in the group at risk for DLD; iii) the verb *ver* 'see' (used in the model provided by the examiner and which introduces embedded clauses) did not appear among the twelve most frequent words in the group at risk of DLD; iv) the element *que* 'that', which also introduces embedded clauses, only appeared in the 9th position in the group at risk of DLD in the retelling mode, while it occupied the 4th position in the TD group in both elicitation modes.

Table 7. The twelve most frequent words in the narratives per group.

	telling-DLD		**retelling-DLD**		**telling-TD**		**retelling-TD**	
	Types	Freq.	Types	Freq.	Types	Freq.	Types	Freq.
1	*e* 'and'	12	*o* 'the$_M$'	12	*o* 'the$_M$'	11	*o* 'the$_M$'	12
2	*a* 'the$_F$'	11	*e* 'and'	11	*e* 'and'	11	*e* 'and'	12
3	*o* 'the$_M$'	10	*a* 'the$_F$'	11	*a* 'the$_F$'	11	*ele* 'he'	11
4	*ele* 'he'	10	*ele* 'he'	11	***que* 'that'**	11	***que* 'that'**	11
5	*na* 'in'	8	*aí* 'then'	9	*foi* 'went'	9	*a* 'the$_F$'	10
6	*aí* 'then'	7	*na* 'in'	9	*na* 'in'	9	*viu* 'saw'	10
7	*uma* 'a$_F$'	7	*viu* 'saw'	8	*viu* 'saw'	9	*na* 'in'	10
8	*um* 'a$_M$'	7	*foi* 'was'	7	*ele* 'he'	8	*uma* 'a$_F$'	10
9	*foi* 'was'	7	***que* 'that'**	7	*um* 'a$_M$'	8	*estava* 'was'	9
10	*cachorro* 'dog'	6	*dele* 'his'	7	*árvore* 'tree'	8	*foi* 'was'	9
11	*raposa* 'fox'	6	*tava* 'was'	7	*uma* 'a$_F$'	8	*com* 'with'	9
12	*rato* 'mouse'	6	*cachorro* 'dog'	6	*com* 'with'	8	*da* 'of'	9

The distribution of different types of clauses (in percentages out of all clauses in each narrative provided) is shown in Table 8. Simple and coordinated main clauses predominated in both groups. Mann-Whitney tests revealed no statistically significant differences between the groups for each type of clause used. Wilcoxon tests showed no differences between the elicitation modes either.[7]

Table 8. Descriptive statistics for sentence types within each group.

	Telling						**Retelling**					
	Simple main clauses		Coordinated clauses		Subordinate clauses		Simple main clauses		Coordinated clauses		Subordinate clauses	
	DLD	TD	DLD	TD	DLD	TD	DLD	TD	DLD	TD	DLD	TD
Mean	54.9	46.4	23.5	30.4	21.6	23.3	51.5	42.5	30.9	28.2	17.6	29.3
SD	16.8	17.3	12.5	14.3	14.4	17	12.6	13.4	17.8	16.6	15	12.8
Median	52.8	47.8	25.5	30.4	17.2	21.8	53.6	41.4	27	30.2	21.8	28
Min	27.3	9	0	0	0	0	25	27.2	12.5	0	0	15
Max	84.6	57.1	38.8	45.5	45.4	62.5	71.4	69.2	42.8	54.5	38.8	45.4

3.3 Inhibitory Control tasks

3.3.1 Flanker

The means for the number of correct responses (CR) (max = 64) and the response time (RT) of the participants in all the three conditions (congruent, incongruent, and neutral) combined, as well as for the critical condition (incongruent) (max =16) are shown in Table 9. A Mann-Whitney test showed that there was no statistically significant difference between the groups for correct responses ($Mdn_{DLD} = 57.5$; $Mdn_{TD} = 62$). Regarding response time, the group at risk of DLD reacted slower ($t(22) = 2.13$, $p = .04$). Regarding the critical incongruent condition, a similar picture emerged: there were no statistically significant differences between groups for

[7] Mann-Whitney results: Simple main clauses (telling: $U = 218$, $z = 0.04$, $p = .96$; retelling: $U = 201.5$, $z = -0.70$, $p = .48$), coordinated clauses (telling: $U = 173.5$, $z = -1.36$, $p = .17$; retelling: $U = 219$, $z = -0.01$, $p = .99$), subordinate clauses (telling: $U = 206.5$, $z = 0.07$, $p = .93$; retelling: $U = 142$, $z = 1.57$, $p = .11$). Wilcoxon: Simple main clauses (DLD: $z = -0.39$, $p = .69$; TD: $z = -0.04$, $p = .65$), coordinated clauses (DLD: $z = 0.15$, $p = .87$; TD: $z = -0.26$, $p = .78$), subordinate clauses (DLD: $z = -0.53$, $p = .59$; TD: $z = -0.54$, $p = .58$).

correct responses (Mdn_{DLD} = 13; Mdn_{TD} = 15), but there was a statistically significant difference for response time ($t(22) = 3.49$, p =.002).

Table 9. Descriptive statistics for Flanker.

	Correct Responses (CR)		**Response time (RT)**		**Incongruent CR**		**Incongruent RT**	
	DLD	TD	DLD	TD	DLD	TD	DLD	TD
Mean	47.8	58.5	959.9	795.2	10.4	14.2	1068.5	801.4
SD	18.4	7.9	228.4	139.3	5.6	2.3	228.5	132.9
Median	57.5	62	978.2	777.4	13	15	1121.9	809.5
Min	16	35	613.9	585.7	1	9	687.4	592.4
Max	62	64	1384.4	1032.6	16	16	1271.0	973.8

3.3.2 Go/no go

The means for the number of correct responses (max = 60) and the reaction time of the participants in both groups for the two conditions (go and no-go) combined, as well as for the critical condition (no-go) (max =15), are shown in Table 10.

Table 10. Descriptive statistics for Go/no-go.

	Correct Responses (CR)		**Reaction time (RT)**		**No-go CR**		**No-go RT**	
	DLD	TD	DLD	TD	DLD	TD	DLD	TD
Mean	56.2	57	782.2	767.2	12.9	12.6	1190	1182.6
SD	4.32	3.4	85.9	63.5	2.4	2.3	124.3	117.7
Median	57.5	58	771.4	763.9	13.5	13.5	1216.8	1229.8
Min	45	50	666.8	631.2	7	8	922.3	960.4
Max	60	60	995.1	879.0	15	15	1300	1300

As observed in Table 10, the means were very close between groups. There were no statistically significant differences between the groups, either for correct responses (Mdn_{DLD} = 57.5; Mdn_{TD} = 58, U = 64.5, critical value of U = 37, z = -0.40, p = .68), or for reaction time ($t(22) = 0.49$, p = .63). Regarding the critical incongruent condition (the no-go condition), a similar picture emerged with no statistical differences between the groups neither for correct responses (U = 66, critical value of U = 37, z = 0.32, p = .75), nor for reaction time ($t(22) = 0.78$, p = .44).

3.4 Correlations

We conducted Spearman correlation analyses, considering the total correct responses in MABILIN, the macrostructures measures in MAIN, and for Flanker and Go-no go tasks, the correct responses and the general response time, and for the most demanding conditions: the incongruent one in Flanker and the no-go in Go-no go. Table 11 shows strong and moderate correlations obtained between MABILIN and the two main measures of MAIN, story structure and story comprehension in the telling and retelling elicitation modes. No correlation was found with GAO sequences. There was a correlation between MABILIN and Internal State (IS) terms in the retelling mode only. These results indicate that performance in MABILIN is mostly correlated with performance in MAIN.

Table 11. Correlations between MABILIN and MAIN.

		Spearman's *rho*	*p*
MABILIN	Story Structure (telling)	0.448	.028*
MABILIN	Story Structure (retelling)	0.735	<.001***
MABILIN	Story Comprehension (telling)	0.448	.03*
MABILIN	Story Comprehension (retelling)	0.464	.02*
MABILIN	GAO sequences (telling)	0.281	.18
MABILIN	GAO sequences (retelling)	0.387	.06
MABILIN	IS terms (telling)	0.240	.26
MABILIN	IS terms (retelling)	0.669	<.001***

Note. * $p < .05$, *** $p < .001$.

Regarding MABILIN and IC tasks, there were correlations between MABILIN and some measures in the Flanker task, but none with the Go-no-go task, as Table 12 shows. A positive correlation was found between MABILIN and the correct responses in the incongruent condition of the Flanker task, and there was also a negative correlation between MABILIN and the response time (in all three conditions) in the Flanker task. This suggests that the ability to resist interference contributes to the performance on the linguistic decision task (pointing to a particular picture).

Table 12. Correlations between MABILIN and Flanker and Go-no go tasks.

		Spearman's *rho*	*p*
MABILIN	Go- no go Correct responses	0.241	.257
MABILIN	No go – Correct responses	0.088	.683
MABILIN	Go-no go Response time	0.130	.544
MABILIN	Flanker Correct responses	0.571	.004**
MABILIN	Flanker Inc – Correct responses	0.512	.011*
MABILIN	Flanker Response time	-0.422	.04*
MABILIN	Flanker Inc – Response time	-0.199	.351

Note. * $p < .05$, ** $p < .01$.

As far as MAIN measures and ICs tasks are considered, Table 13 shows that no significant correlations were obtained.

Table 13. Correlations between MAIN measures and Flanker and Go-no go tasks.

		Spearman's *rho*	*p*
Story Structure (telling)	Go- no go Correct responses	0.044	.838
Story Structure (telling)	No go – Correct responses	-0.137	.524
Story Structure (telling)	Go-no go Response time	-0.238	.263
Story Structure (telling)	Flanker Correct responses	0.384	.064
Story Structure (telling)	Flanker Inc – Correct Responses	0141	.511
Story Structure (telling)	Flanker Response time	-0.221	.299

Story Structure (telling)	Flanker Inc – Response time	-0.296	.160
Story Structure (retelling)	Go- no go Correct responses	0.227	.287
Story Structure (retelling)	No go – Correct responses	0.246	.247
Story Structure (retelling)	Go-no go Response time	0.373	.073
Story Structure (retelling)	Flanker Correct responses	0.155	.468
Story Structure (retelling)	Flanker Inc – Correct Responses	0.230	.279
Story Structure (retelling)	Flanker Response time	-0.240	.258
Story Structure (retelling)	Flanker Inc – Response time	-0.372	.073
Story Comprehension (telling)	Go- no go Correct responses	0.276	.192
Story Comprehension (telling)	No go – Correct responses	0.184	.388
Story Comprehension (telling)	Go-no go Response time	0.167	.436
Story Comprehension (telling)	Flanker Correct responses	0.374	.072
Story Comprehension (telling)	Flanker Inc – Correct Responses	0.367	.078
Story Comprehension (telling)	Flanker Response time	-0.205	.336
Story Comprehension (telling)	Flanker Inc – Response time	-0.046	.831
Story Comprehension (retelling)	Go- no go Correct responses	0.127	.555
Story Comprehension (retelling)	No go – Correct responses	0.213	.317
Story Comprehension (retelling)	Go-no go Response time	0.148	.491
Story Comprehension (retelling)	Flanker Correct responses	0.147	.492
Story Comprehension (retelling)	Flanker Inc – Correct Responses	0.310	.141
Story Comprehension (retelling)	Flanker Response time	-0.323	.123
Story Comprehension (retelling)	Flanker Inc – Response time	-0.225	.290
GAO sequences (telling)	Go- no go Correct responses	0.081	.708
GAO sequences (telling)	No go – Correct responses	-0.022	.917
GAO sequences (telling)	Go-no go Response time	0.057	.792
GAO sequences (telling)	Flanker Correct responses	0.139	.516
GAO sequences (telling)	Flanker Inc – Correct Responses	0.016	.939
GAO sequences (telling)	Flanker Response time	-0.059	.785
GAO sequences (telling)	Flanker Inc – Response time	0.064	.768
GAO sequences (retelling)	Go- no go Correct responses	-0.120	.577
GAO sequences (retelling)	No go – Correct responses	-0.058	.788
GAO sequences (retelling)	Go-no go Response time	0.309	.142
GAO sequences (retelling)	Flanker Correct responses	-0.177	.408
GAO sequences (retelling)	Flanker Inc – Correct Responses	0.041	.851
GAO sequences (retelling)	Flanker Response time	-0.036	.868
GAO sequences (retelling)	Flanker Inc – Response time	-0.330	.115
IS terms (telling)	Go- no go Correct responses	-0.130	.546
IS terms (telling)	No go – Correct responses	-0.268	.205
IS terms (telling)	Go-no go Response time	-0.129	.547
IS terms (telling)	Flanker Correct responses	0.121	.573
IS terms (telling)	Flanker Inc – Correct Responses	-0.123	.566
IS terms (telling)	Flanker Response time	-0.193	.365
IS terms (telling)	Flanker Inc – Response time	-0.294	.163
IS terms (retelling)	Go- no go Correct responses	0.136	.527
IS terms (retelling)	No go – Correct responses	0.051	.813
IS terms (retelling)	Go-no go Response time	0.231	.278
IS terms (retelling)	Flanker Correct responses	0.271	.200

IS terms (retelling)	Flanker Inc – Correct Responses	0.131	.540
IS terms (retelling)	Flanker Response time	-0.234	.272
IS terms (retelling)	Flanker Inc – Response time	-0.313	.136

4 Discussion and conclusion

This study is an initial evaluation of possible relations between children´s performance in MABILIN, their narrative skills assessed by MAIN, and executive functions, particularly inhibitory control, assessed by a Flanker task and a Go-no go task. To our knowledge, this is the first study using MAIN in Brazilian Portuguese to compare TD children and children at risk of DLD. Children were grouped as TD or at risk of DLD based on their results in MABILIN, an instrument largely used in BP to identify children with syntactic impairment. This study addressed four research questions. Here, the results are described and discussed in turn.

(1) Does the ability to comprehend linguistic skills/costly structures correlate with narrative skills in children at risk of DLD?

The results for narrative macrostructure showed a difference between children at risk of DLD and TD for *story structure* in both elicitation modes (telling, retelling), with the TD group showing better performance. This aligns with previous studies in different languages (Blom & Boerma, 2016; Kraljević et al., 2020; Pham et al., 2019; Sheng et al., 2020). An effect of the elicitation procedure was also found, but only in the TD group, which performed better in the retelling mode. Previous results are somewhat mixed, but some studies found significantly higher scores in retelling (Roch et al., 2016; Otwinowska et al., 2020; Kraljević et al., 2020). In this study, TD group also performed better in the retelling mode regarding complete episodes (GAO-sequences) and internal state terms. Therefore, it seems that the group at risk of DLD did not benefit from the model presented by the experimenter.

As far as *story comprehension* is concerned, no differences were obtained between the groups. This is in accordance with the findings by Blom and Boerma (2016), who reported a difference in story comprehension between the DLD and TD groups at age 5-6, but not at age 6-7, suggesting that this difference disappears with age. Notably, our participants were older than seven and had not received special care or treatment.

Regarding narrative microstructure, the groups did not differ in terms of type/token ratio and percentages of types of sentences used. However, the subordinating element *que* 'that', which introduces subordinate clauses, was not part of the twelve most frequent words in the group at risk of DLD in the telling mode, and occupied the 9th position in the retelling model. In the TD group, it was the 4th most used word in both elicitation modes.

(2) Are there correlations between linguistic measures and measures of narrative macrostructure?

The correlations obtained between MABILIN score and MAIN measures (*story structure* and *story comprehension* in both modes of elicitation, and *IC terms* in the retelling mode) suggest an association between the mastery of complex structures and narrative skills.

(3) Are there correlations between linguistic and inhibitory control measures?

Regarding executive functions, the correlations between MABILIN and Flanker align with previous results (Kaushanskaya et al., 2017; Marini et al., 2020; Everaert et al., 2023),

indicating that resistance to interference can be a relevant factor for dealing with this comprehension task. Moreover, the ability to inhibit distracting information and to focus on a given target can be associated with sustained attention (Cowley, 2018).

(4) Are there correlations between narrative macrostructure and inhibitory control measures?

No correlations were found between MAIN measures and the executive functions tasks. In any case, Scionti et al. (2023) state that links between EFs and narrative skills are weakened after the age of 7, which may explain the absence of significant results in these groups of 8-year-old children.

In a nutshell, our results suggest that the ability to handle costly structures in a decision task can be related to children's performance at the macrostructure level of narrative tasks. Concerning microstructure, for future investigations, it would be valuable to incorporate costly sentences into the narratives used as retelling models to verify the extent to which children would reproduce them.

In sum, this first evaluation of the narrative skills of BP-speaking children using MABILIN and MAIN suggests that interventions targeting complex structures in decision tasks can contribute to language-impaired children's development across different language performance modes.

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