



**The effects of an oral narrative-based intervention on  
the development of the non-dominant language in  
bilingual Catalan-Spanish preschoolers**

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# **The effects of an oral narrative-based intervention on the development of the non-dominant language in bilingual Spanish-Catalan preschoolers**

## **Abstract**

Examining the narrative microstructure of non-dominant bilinguals is crucial as it can help us comprehend the processes of simultaneous language acquisition and how children develop their language skills, potentially enhancing their performance in the non-dominant language. This study aims to examine the impact of a narrative-based language intervention on the linguistic microstructure of Catalan, a non-dominant language, in preschoolers residing in the Spanish-dominant area of L'Hospitalet de Llobregat, Catalonia. The intervention follows the MultiModal Narrative (MMN) training (Florit-Pons et al., 2022), targeting macrostructural elements like narrative and pragmatic skills, hand and bodily gestures, facial expressions, and prosody. Previous research suggests that macro-level interventions can influence microstructural aspects such as lexical production and diversity. The study compares two groups ( $n = 74$ ): one receiving the narrative intervention (non-multimodal) and the other a control group. The Intervention involves interactive retelling activities of Catalan stories over nine sessions. Pre- and post-intervention, children retell a story, and their retellings are analyzed. Total number of words (TNW) and total number of different words (TNDW) are used as indices of lexical productivity and variety. Results show increased TNW and TNDW in the lexical microstructure of Catalan after the intervention, indicating enhanced language skills. This study contributes to the literature on narrative-based language interventions for bilingual children and offers insights for educational practice and policy in supporting language development in this population.

Keywords: non-dominant language, unbalanced bilingual, bilingualism, Spanish, Catalan, narrative intervention, language acquisition, preschoolers, microstructure, lexical productivity, lexical diversity, TNW, TNDW

## **1. Introduction**

### **1.1 Phenomenon of bilingualism**

Bilingualism is a complex and multifaceted phenomenon that can be approached from various perspectives. Firstly, it is important to recognize that bilingualism does not require an equal proficiency or fluency in both languages. Bilingual individuals have their own unique linguistic configuration and possess a specific communicative competence that allows them to effectively navigate different linguistic situations. They can utilize one language, the other language, or a combination of both, depending on the context, topic, or interlocutor (Grosjean, 1989). For instance, while some participants may primarily use Spanish, it is essential to adopt a broader definition of bilingualism that encompasses proficiency in multiple languages rather than just one (Valian, 2015).

The exposure to both languages from an early age is a critical aspect of bilingual acquisition. Children who have been exposed to two languages from an early age, such as from birth or the age of 3, are often referred to as early sequential bilinguals (Montrul, 2008). This term accurately describes the participant sample, as they have been exposed to both Catalan and Spanish during their formative years. Research suggests that sequential bilingualism, with a solid foundation in the first language before intense exposure to the second language, leads to a higher level of language proficiency compared to simultaneous bilingualism (Montrul, 2010). Therefore, the participants' exposure to both languages, even if one is predominantly acquired through schooling, supports their bilingual classification. It is important to recognize that the level of proficiency in each language might differ among bilingual individuals, and the need for each language can vary depending on the context (Grosjean, 1989). Thus, the fact that some participants may exhibit greater fluency or preference for Spanish does not negate their bilingualism. Bilingualism is not solely determined by the level of proficiency in each language but encompasses the ability to effectively communicate and function in both languages.

In bilingual contexts where one language dominates over the other, understanding the impact of acquiring the non-dominant language is essential. For example, in the Catalan system, the majority of students are Catalan-Spanish bilinguals, even if Catalan is primarily acquired through schooling. Based on these studies, the participants are still exposed to and actively engage with this language, indicating their bilingual abilities.

## **1.2 Sociolinguistic context**

The L'Hospitalet de Llobregat (Barcelona, Catalonia) is a primarily Spanish-dominant area in a Catalan-Spanish bilingual context. Both Catalan and Spanish are official languages in Catalonia, with Catalan being the vehicular language of education according to Law 8/2022, Article 2, of 9 June (Government of Catalonia, 2022). In L'Hospitalet de Llobregat, the reported knowledge of Catalan for comprehension was 88.3%, indicating a relatively high level of understanding, while the reported knowledge for speaking was 62.1% (2018, EULP, Idescat). These statistics, based on a survey conducted by the General Directorate of Language Policy and the Statistical Institute of Catalonia, reveal a discrepancy between comprehension and active language production. The survey involved a random selection of 224,569,445 citizens over the age of 15, representing the general population. It identified Catalan as the initial language reported by 12.2% of respondents, Spanish by 72.5%, and other languages by 11.8%. Although Spanish dominates as the most widely spoken language, the significant reported comprehension of Catalan indicates its presence in the community. The lower reported proficiency in speaking Catalan can be attributed to factors such as the influence of Spanish as the dominant language and varying levels of exposure and language use among residents. These findings describe the language demographics and proficiency levels in L'Hospitalet de Llobregat, contributing to our understanding of bilingualism dynamics in the region.

## **1.3 Catalonia's plurilingual and intercultural educational model**

The present study is driven by the need to enhance the status of Catalan, a non-dominant language, particularly in Spanish-dominant regions of Catalonia. This need is supported by Law 1/1998 from the Generalitat de Catalunya, enacted on January 7th, which recognizes the challenges related to the Catalan language's lack of normalization and limited international presence. Considering the country's linguistic diversity, there is a pressing need for a language policy that not only promotes Catalan normalization but also ensures the protection of linguistic rights for all citizens. This study aims to contribute to the development and implementation of an effective language policy framework. (p. 1, [our interpretation], see Gómez-Martínez for their translation).

#### **1.4 Narrative interventions and language acquisition**

As explained in Pico et al. (2021), narratives provide a unique opportunity to observe children's natural language production, as they often involve events and situations that extend beyond the immediate context of the narrator and audience. This allows researchers to observe children's naturally occurring language production and study language development without the potential influence of rote memorization or other external factors. According to the findings of Soto et al. (2009), students who engage in narrative-focused instruction and utilize augmentative and alternative communication devices experience notable advancements in both story complexity and linguistic complexity (see Pico et al, 2021). The aim of incorporating narratives into the classroom educators is to enhance children's abilities to express themselves effectively and coherently in spoken and written language and narratives offer a rich source of linguistic data, which allows researchers and practitioners to examine factors such as productivity and complexity (Justice & Bowles, 2006). Additionally, the promotion of oral language and narratives in children has shown positive effects on their general linguistic and social abilities, as well as academic performance (Albirini et al., 2011; Montrul, 2010). Active participation in storytelling and oral language experiences can enhance the linguistic abilities of children, such as their vocabulary acquisition, grammar, and communication skills. Ultimately, these positive effects of narrative interventions may extend to academic performance, as language proficiency is often crucial for success in various educational contexts (Lanvers, 2001 as cited in Sczepurek et al, 2022; Prevoo et al., 2016, as cited in Vettori et al, 2022). By teaching children to tell stories in line with curriculum expectations, educators are facilitating code-switching rather than code-overwriting, fostering language development (Spencer & Petersen, 2020). Overall, implementing narrative-based interventions holds promise for improving language learning outcomes and supporting the holistic development of children's linguistic skills.

All in all, considering the positive effects of narrative interventions on first language acquisition, including enhanced expressive abilities, improved social skills, and overall linguistic development, the potential of utilizing narrative interventions to empower a non-dominant language becomes a compelling motivation for this study.

As referenced in the review study by Spencer and Petersen, (2020), the authors emphasize the importance of integrating children's first language into oral language instruction. They suggest that by doing so and achieving meaningful improvements in English, there is an additional

advantage of fostering a society that is bilingual and biliterate (Collier & Thomas, 2017). Also mentioned in Spencer & Petersen (2020) is that, indeed, when children are provided with strategic language instruction in their first language, it is plausible that their knowledge and language skills may transfer to their second language (L2), and vice versa in certain cases (Marian & Kaushanskaya, 2007). The concept proposed suggests that cross-language interactions can occur within structures that possess a comparable underlying cognitive framework. These structures represent the mental organization of previous experiences and play a significant role in this process, which is observable through narration (Anderson & Pearson, 1984; MacWhinney, 1999; Stein & Glenn, 1979). In the mentioned study, striking similarities were found in the organization of narratives between English and Spanish, suggesting that the narrative schemas in both languages are comparable. A narrative, also known as a cognitive schema, refers to a generalized mental model or framework that aids individuals in comprehending the world around them. It consists of rules, principles, and expectations that guide the processing and organization of information. These schemata assist individuals in making sense of their experiences by categorizing and interpreting new information based on their existing knowledge and beliefs (Anderson, 1984; Mandler, 1984, as cited in Spencer & Petersen, 2018). It is reasonable to assume that the concept of cross-language interactions and comparable narrative schemas would apply to languages that are similar, such as Spanish and Catalan, given the close linguistic relationship of the languages.

### **1.5 Narrative macrostructure and microstructure**

One common way to assess the gains of narrative-based interventions is the assessment of the quality of the narratives before and after training. Two main dimensions have been proposed, namely macrostructure and microstructure. First, macrostructure refers to the overall structure or organization of a story, focusing on its higher-level components. It is commonly operationalized through story grammar components, such as setting, initiating event, attempt, consequences, and resolution. These components provide a framework for analyzing and understanding the narrative structure (Fiestas & Peña, 2004, as cited in Rezzonico et al., 2015). On the other hand, microstructure pertains to the detailed aspects of language use within a story or discourse. It encompasses various measures such as productivity, language complexity, language accuracy, and cohesion. Productivity measures involve quantifying the number of utterances or words used, while language complexity focuses on factors like sentence length and syntactic structures. Language accuracy assesses the correctness of verb usage, and



cohesion is evaluated through the use of referring expressions to establish connections within the narrative. Microstructure measures provide insights into the specific linguistic features employed in the story (Cleave et al., 2010; Fiestas & Peña, 2004; Iluz-Cohen & Walters, 2012; Norbury & Bishop, 2003; Pearson, 2002; Schneider & Hayward, 2010; Uccelli & Paéz, 2007, as cited in Rezzonico et al., 2015). Narratives exhibit a microstructure that incorporates syntax, morphology, semantics, and other language features, reflecting literate, academic language and adding complexity to the narratives (Colozzo et al., 2011; MacLachlan & Chapman, 1988). Narrative microstructure can be segmented into productivity factors, including the total number of words (henceforth TNW) and total number of different words (henceforth TNDW), which reflect lexical diversity and vocabulary use in children (Klee, 1992; Miller, 1991; Muñoz et al., 2003; Owen & Leonard, 2002; Strong, 1998; Watkins et al., 1995). In short, macrostructure is commonly understood to encompass the discourse level, focusing on the overall structure and organization of a narrative. In contrast, microstructure typically pertains to the sentence level, addressing the detailed aspects of language use within the narrative. All these variables further allow researchers to analyze linguistic proficiency.

## **1.6 Research objectives and research question**

The central research question of the present study is the following: Does a narrative-based intervention lead to improvements in preschoolers' narrative microstructure, as indicated by measures such as lexical productivity and diversity when compared to treatment as usual? The hypothesis for this study posits that (a) both TNW and TNDW variables will demonstrate significant improvement from pre-test to post-test when analyzing the use of both Catalan and Spanish in narrative retellings, and (b) while both TNW and TNDW are expected to demonstrate a substantial improvement in Catalan, there will be no significant improvement for Spanish.

The motivation behind this study lies in recognizing the potential of oral narrative interventions to promote and enhance the use of non-dominant languages. Narratives, with their language adaptable to children's everyday life and capacity to capture children's natural language production, offer a unique avenue for promoting linguistic development without relying on memorization or other influences. Research has demonstrated that narrative-focused instruction can significantly enhance story and linguistic complexity (Petersen et al., 2010, as cited in Pico et al., 2021). Moreover, narratives serve as a rich source of linguistic data,

enabling researchers and practitioners to analyze acquisition indexes such as productivity and complexity, ultimately enhancing children's expressive abilities in spoken and written language. Beyond language proficiency, engagement in narratives has shown positive effects on social skills and are predictors of academic performance (Lanvers, 2001 as cited in Sczepurek et al, 2022; Prevoo et al., 2016, as cited in Vettori et al, 2022). By integrating children's first language into oral language instruction, the potential for cross-language interactions and the transfer of knowledge between languages becomes evident. In light of these findings, the exploration of narrative interventions as a means to empower non-dominant languages emerges as a compelling motivation for this study.

To investigate the effectiveness of narrative-based interventions in promoting Catalan language use and enhancing specific linguistic microstructure indexes among preschoolers, we conducted a comparative analysis of narrative microstructure before and after training in two groups of students. While the experimental group received the narrative-based intervention, the control group followed a treatment-as-usual with standard activities. Throughout the nine interactive sessions, the intervention involved narrative retelling activities centered around Catalan stories. The impact of the intervention was evaluated by measuring the variables: total number of words, which reflects lexical productivity, and total number of different words, which reflects lexical diversity. These measures were assessed through two untrained narrative retelling tasks administered prior to and after the intervention. By exploring this research question, the study aims to contribute valuable insights into the advantages and effectiveness of narrative-based interventions in promoting Catalan language use and facilitating narrative microstructure development in the non-dominant language of bilingual preschoolers.

## **2. Methods**

This study has been conducted as part of a bigger project involving the creation and application of the MultiModal Narrative Intervention (Florit-Pons et al., 2022). The author of this thesis actively participated in the data collection of the study which took place during the 2022-23 academic year. Additionally, for the present study during the months of February through May the author of this thesis orthographically transcribed and then analyzed the microstructure variables of the pre-test and post-test narrative tasks for both the experimental group and control group .

## 2.1 Participants

The sample for the current study includes 74 5-year-old children (*Mean age* = 5.4; *SD* = .3434; *male* = 40; *female* = 34), all residing in L'Hospitalet de Llobregat, a Spanish-Catalan bilingual city located in the metropolitan area outside of Barcelona, Catalonia. According to parent-reported linguistic data, 61 participants have a bilingual background with Catalan as the non-dominant language.

With this in mind, our participant sample can be classified as bilinguals based on several factors. Firstly, participants language proficiency measures were measured with responses provided by the parent-reported LEAP-Q questionnaire. Proficiency is measured with a scale of high proficiency, medium proficiency, and low proficiency. The percentage range values that allow for the classification of participants according to the percentage of time that their child currently and on average uses each language (Catalan, Spanish, other), the percentage of time that their child currently and on average listens to each language (Catalan, Spanish, other). Along with those questions, the parents were asked to mark their child's skill level for speech and understanding in Catalan and Spanish between high proficiency ("Perfect," "Excellent," "Very good"), medium proficiency ("Good," "Slightly more than Adequate", "Adequate," and "Slightly less than Adequate,"), and low proficiency ("Fair," "Low," and "Very low"). We have exercised our own judgment to assign those to the three listed categories.

Parents were informed of the intervention design, and all of them gave written consent to participate in the study. To assess the bilingual linguistic profile of the children, a parental questionnaire was administered. This questionnaire included a subset of questions from the Language Experience and Proficiency Questionnaire (LEAP-Q<sup>1</sup>) for children, adapted from Puig-Mayenco et al. (2018), which was originally derived from the adult version of the LEAP-Q (Marian et al., 2007). The subset of questions aimed to establish bilingual language status. Out of the 74 participants in the study, the parent-reported LEAP-Q questionnaire was completed by parents of 64 participants, allowing us to analyze the sociolinguistic background information from 86.49% of the total participants.

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<sup>1</sup> As in previous investigations conducted by Florit-Pons, the questions from the questionnaire were translated from Spanish into Catalan, and the questionnaire in both languages was provided to the families.

The parent-reported LEAP-Q information provided insights into the proficiency levels of participants in speaking and comprehension. Analyzing the data revealed interesting patterns regarding language usage. In terms of Catalan, the results indicate a concentration of usage towards the lower percentage ranges. Specifically, 32.79% of the responses reported no use or minimal usage (0-25% range), and an additional 32.79% reported infrequent usage (26-50% range). Similarly, for Spanish, a higher prevalence was observed in the higher percentage ranges. This includes 32.79% of the responses indicating moderate usage (51-75% range) and 44.26% indicating frequent usage (76-100% range). The distribution of language proficiency levels and the dominance of Spanish in the higher percentage ranges suggest a predominant Spanish-dominant pattern among the participants. However, it is important to note that there are still participants who reported moderate usage of Catalan in the 51-75% range (27.87% of the responses) and some participants who reported infrequent usage of Spanish in the 26-50% range (19.67% of the responses). To assess the significance and determine the true differences in language usage, a Chi-square test was conducted, and the differences were proved significant, ( $\chi^2(3) = 55.79$ ;  $p < .001$ ).

**Table 1. Child's Language Usage in our preschooler sample according to parental questionnaire: Average Percentages<sup>2\*</sup>**

Range**	Catalan	Spanish
0-25%	32.79%	3.28%
26-50%	32.79%	19.67%
51-75%	27.87%	32.79%
76-100%	6.56%	44.26%

*\*This parent-reported participant data reflects the data reported by Idescat (2018).*

*\*\*0-25% = language not used at all or barely; 26-50% = language used very infrequently to sometimes; 51-75% = language used half the time or more; 76-100% = language used frequently or all the time.*

Additionally, based on the survey responses, it is justifiable to classify our sample as a Spanish-dominant population given the higher reported percentages of lower proficiency levels in speaking and comprehending Catalan (see Table 2). The data revealed that a considerable number of participants indicated medium or low proficiency in both speaking and comprehending Catalan, whereas in Spanish, comparatively higher percentages reported high proficiency. This indicates a clear inclination towards stronger linguistic competence and

<sup>2</sup> For the question from the adapted LEAP-Q questionnaire, see Appendix 2, question 4.

dominance in Spanish among the participants, thereby supporting the classification of the sample as Spanish-dominant.

**Table 2. Speaking and Comprehension Proficiency in our preschooler sample according to parental questionnaire: Average Percentages<sup>3</sup>**

<i>Proficiency group</i>	<i>Proficiency</i>	<i>Speaking</i>		<i>Comprehension</i>	
		<i>Catalan</i>	<i>Spanish</i>	<i>Catalan</i>	<i>Spanish</i>
<b>High</b>	<b>Perfect</b>	0%	22.95%	9.84%	29.51%
	<b>Excellent</b>	4.92%	14.75%	9.84%	18.03%
	<b>Very good</b>	21.31%	22.95%	31.15%	22.95%
<b>Medium</b>	<b>Good</b>	16.39%	16.39%	13.11%	14.75%
	<b>Slightly more than adequate</b>	8.2%	0%	3.28%	1.64%
	<b>Adequate</b>	6.56%	11.48%	11.48%	1.64%
	<b>Slightly less than adequate</b>	4.92%	0%	1.64%	0%
<b>Low</b>	<b>Fair</b>	11.48%	9.84%	16.39%	11.48%
	<b>Low</b>	13.11%	1.64%	1.64%	0%
	<b>Very low</b>	4.92%	0%	1.64%	0%

## 2.2 Experimental design and procedure

The present study utilized a between-subjects design with a narrative intervention involving pre- and post-test assessments. Originally developed for a broader project investigating narrative and pragmatic abilities, the MultiModal Narrative (MMN) intervention program aligns with the objectives of the present study, and the data utilized for this study was collected from this project. The MMN program consists of 9 sessions dedicated to improving children's macrostructure narrative skills, along with their pragmatic skills.

<sup>3</sup> For the question from the adapted LEAP-Q questionnaire, see Appendix 2, questions 6 and 7.

For the present study, we will focus on two groups: the control group, which did not receive the MMN intervention, but rather continued with the regular activities in the classroom, and the experimental group, which received the non-multimodal MMN intervention treatment<sup>4</sup>. The number of participants in each group were collected from six different classrooms (three for the experimental and three for the control group). The three experimental classrooms participated in nine training sessions between the pre- and post-test examinations. This intervention included three sessions of training for oral language skills per week, each lasting approximately 25 minutes, and it was led by the preschool teachers who received training by Florit-Pons, Prieto and Igualada. These activities were conducted in Catalan with a focus on story comprehension and retelling together with emotion understanding and perspective taking. During the session, children watched a 2:30-minute cartoon (*Chigüiro*, Ivar da Coll, s.d.) followed by a video of a storyteller retelling the story. After that, depending on the session, the activities conducted were different: on the first day of each cartoon (i.e., sessions 1, 4 and 7), children participated in a group retelling task using a question-and-answer sequence in which the teacher asked questions about the story plot –including characters, problems, resolution, and their associated emotions– and children answered. On the second day of each cartoon (i.e., sessions 2, 5 and 8) the classroom participated in a theater-based activity where children had to act as the storyteller and retell parts of the story to their classmates. On the final day of each cartoon (i.e., sessions 3, 6 and 9), the activity focused on personal narratives: first the teacher explained a personal story that was related to the fictional story and after that she encouraged the children to explain their personal stories.

On the other hand, the control group received treatment-as-usual, which consisted of the regular classroom instruction provided by their preschool teachers. The instruction in the control group followed the usual curriculum guidelines established by the Catalan Department of Education for preschool education. However, no specific intervention or strategies targeting language development were implemented during the study period.

### **2.3 Pre- and post-test assessments**

To examine the impact of the narrative intervention on the use of the Catalan language, we assessed the frequency of its usage before and after the intervention using the same narrative

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<sup>4</sup> Florit-Pons, J., Prieto, P., & Igualada, A. (2022, June 30). Multimodal narrative (MMN): An inclusive multimodal narrative-based intervention for Preschool Children. OSF. <https://osf.io/39hef/>

task for the two groups. The narrative task was conducted individually in a quiet room at each participant's school, and audiovisual recordings were made using a digital video camera to be able to annotate the retellings afterward.

Participants were prompted by the examiners to respond in Catalan for the narrative tasks. The examiners exclusively spoke in Catalan, and at the beginning of the pre-test and post-test sessions they explained to the children that they have difficulties understanding Spanish, therefore it was necessary to speak in Catalan in order to help them understand better (e.g., “I only speak Catalan and it's hard for me to understand Spanish. Could you speak to me in Catalan so that I can understand you?”). If the participant persisted in using Spanish, they were reminded up to a maximum of three times per session. They were reminded that this would have helped the examiner if they could speak in Catalan. (e.g., “Remember that I don't understand Spanish, can you explain it to me in Catalan?”).

The narrative retelling task comprised two wordless animated cartoons, one administered during pre-test and the other during post-test session. The pre-test cartoon, “Löchersocken”<sup>5</sup> had a duration of 41 seconds, and the post-test cartoon, “Gitarre”<sup>6</sup> had a duration of 48 seconds. Both animated cartoons for pre- and post- test were different, however they followed the same basic narrative structure wherein a protagonist encounters a challenge and then finds a solution. In order to maximize the opportunity for observing and analyzing potential improvements in participants' frequency of Catalan language use following the intervention, we deliberately chose untrained materials. This involved using different cartoons for the pre- and post-test sessions, ensuring that participants could not memorize or learn the narrative from the pre-test session. Additionally, the choice of wordless cartoons ensured that children did not receive any linguistic input during the retelling task.

Firstly, the child watched the video clip apart from the examiner. Then the participant stood in front of the video camera and was prompted to give a narrative retelling as best as (s)he could in Catalan. Lastly, the examiner presented a guessing game, where she had to guess the story

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<sup>5</sup> Cartoon administered before the intervention, “Löchersocken”. *Die Sendung mit der Maus*. Available at: <https://www.wdrmaus.de/filme/mausspots/loechersocken.php5>

<sup>6</sup> Cartoon administered after the intervention, “Gitarre”. *Die Sendung mit der Maus*. Available at: <https://www.wdrmaus.de/filme/mausspots/gitarre.php5>

that the child had retold from a set of 4 images, given that supposedly (s)he had supposedly not previously viewed the cartoons (see Figure 1).

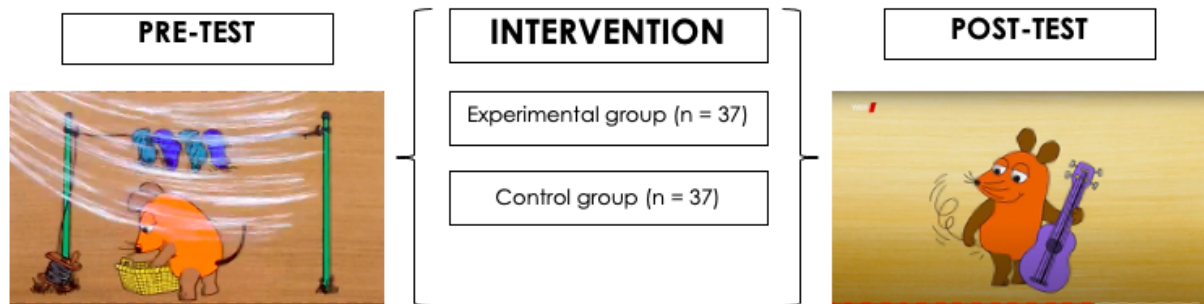


Figure 1. *Experimental design with visuals of video material from “Löchersocken” and “Gitarre”.*

## 2.4 Data coding

To investigate the research question regarding narrative microstructure, in terms of word productivity (total number of words and total number of different words) in Catalan, we analyzed a total of 148 stories (i.e., 1 story x child x 2 times x 74 children).

Each narrative was manually transcribed orthographically. Subsequently, the narrative samples were analyzed in Computerized Language Analysis (CLAN) software, which provides measures of linguistic performance and complexity (MacWhinney, 2014 according to CHAT guidelines) (see Appendix 2 for annotations used) where they were further segmented into utterances or Communication Units (C-Units), following the conventions proposed by Loban (1976) and Hernández et al. (2018), to facilitate microstructure analysis of oral communication. Furthermore, to effectively work with the transcriptions, they were modified according to the CHAT guidelines for multilingual corpora, incorporating supplementary codes and annotations to enrich the transcript. For an example of the annotations used in the transcriptions based on the guidelines and conventions mentioned above, please refer to Figure 2.



```

@Begin
@Languages: cat, spa
@Participants: CHI Child, INV Investigator
@ID: cat, spa|MMN|CHI||||Child|||
@ID: cat|MMN|INV||||Investigator|||
@Transcriber: Claire
*CHI: que@s:spa estava@s:spa tendiendo@s:spa
      la@s:spa ropa@s:spa +//.
*INV: t'en [: te] recordes que em costa molt
      entendre en castellà?
*INV: intenta fer-ho en català.
*CHI: que estava tendent la ropa@s:spa.
*CHI: i salt amb el vent, se@s:spa le@s:spa
      cafa@s:spa.
*CHI: havia quitat@s:spa+cat la cosa.
*CHI: <havia tret la cosa> [/] havia tret la cosa.
*CHI: i havia posat els mitjons.
@End

```

Figure 2. Example of annotations used in the transcriptions for analysis (U52\_pre).

As mentioned above, the analysis involved examining the frequency of Catalan words by examining TNW and TNDW. Total number of words (TNW, or tokens) is an indicator of productivity, representing the overall amount of language produced by the participants and total number of different words (TNDW, or types) as a measure of diversity, reflecting the variety of unique words used by the participants. These measures were carefully analyzed to provide a comprehensive understanding of the participants' linguistic abilities and development, offering insights into their productivity and lexical diversity in the language samples collected for the study. The mentioned measures are used to quantitatively assess the linguistic microstructure and provide insights into the participants' language skills and development. Repetitions and rephrases were excluded from the calculation in this study. This decision was made to ensure that the calculated measures, such as word count, were not inflated by redundant language use. By excluding repetitions and rephrases, the study aimed to obtain a more accurate and reliable assessment of the linguistic microstructure, focusing on unique and meaningful language production. This approach was taken to ensure that the results and findings of the study were not skewed by repetitive language use and provided a clearer understanding of the participants' linguistic abilities and development.

In order to assess the improvement of participants' narrative abilities at a microstructure level, we created two distinct datasets, one for Spanish-dominant and one for Catalan-dominant speakers. Bilingual language status (dominance) was determined by evaluating the parental

questionnaire data. Participants whose parents reported their children's first language as Catalan were identified, creating the Catalan L1 dataset, and leading to the formation of a dataset comprising L1 Spanish speakers. Among the 74 participants, questionnaire reports were completed for 64 participants. The reports indicated that the majority of participants acquired Spanish as their first language (75%), followed by Catalan (23%), and a small percentage reported French as their first language (2%). To measure reported bilingual Spanish-Catalan dominance, we consulted the questionnaire data and separated the participants into two distinct datasets: one for those who were dominant in Spanish (52%) and another for those who were dominant in Catalan (48%).

## 2.5 Statistical analyses

In order to determine whether children improved their narrative skills after receiving the intervention, the microstructure data was extracted and analyzed in a two-step procedure. First, the annotated data from the narratives were retrieved using CLAN (MacWhinney, 2014). For each narrative, we extracted the total number of words (TNW) and the total number of different words (TNDW). TNW and TNDW were calculated for the whole narrative, but also counting Catalan words and Spanish words separately. For this, for each narrative we had six different scores, TNW and TNDW. Second, to explore the potential effect of the intervention, six different Generalized Linear Mixed Models (GLMM) were performed using the *glmmTMB* package (Brooks et al., 2017) in R (R Core Team, 2021). In each GLMM model, the dependent variable was the TNW or the TNDW (i.e., TNW total, TNW in Catalan, TNW in Spanish, TNDW in total, TNDW in Catalan and TNDW in Spanish). Test (two levels: pre-test and post-test) and Condition (two levels: experimental and control) were set as fixed factors, together with their two-way interaction. Participant was included as a control variable in the models. Finally, post-hoc pairwise comparisons with Bonferroni correction were run using the *emmeans* package (Lenth, 2021).

## 3. Results

In this section we will report the results of the analyses assessing two important elements of narrative microstructure before and after training, namely the total number of words and the total number of different words. These microstructure variables were analyzed in a bilingual

sample of narratives comprising Catalan and Spanish. The analysis involved comparing the performance of an experimental group and a control group across pre-test and post-test.

### 3.1 Total Number of Words

The model assessing the TNW of the bilingual sample, that is including data from both Catalan and Spanish, showed no significant main effect of Test ( $p = .1069$ ) or Condition ( $p = .0686$ ). However, the model reported a significant interaction between Test and Condition ( $\chi^2(1) = 12.3724$ ;  $p = .0004357$ ), which indicated that there was a significant improvement from pre-test to post-test in the experimental group ( $t(72) = -9.24$ ;  $SE = 2.5$ ;  $p = .0021$ ), but no significant improvement in the control group ( $p = .7288$ ). The interaction also suggested that at post-test the experimental group had significantly higher scores than the control group ( $t(120) = -11.62$ ;  $SE = 3.42$ ;  $p = .0036$ ), while there were no significant differences between them at pre-test ( $p = 1$ ) (see Figure 3 below).

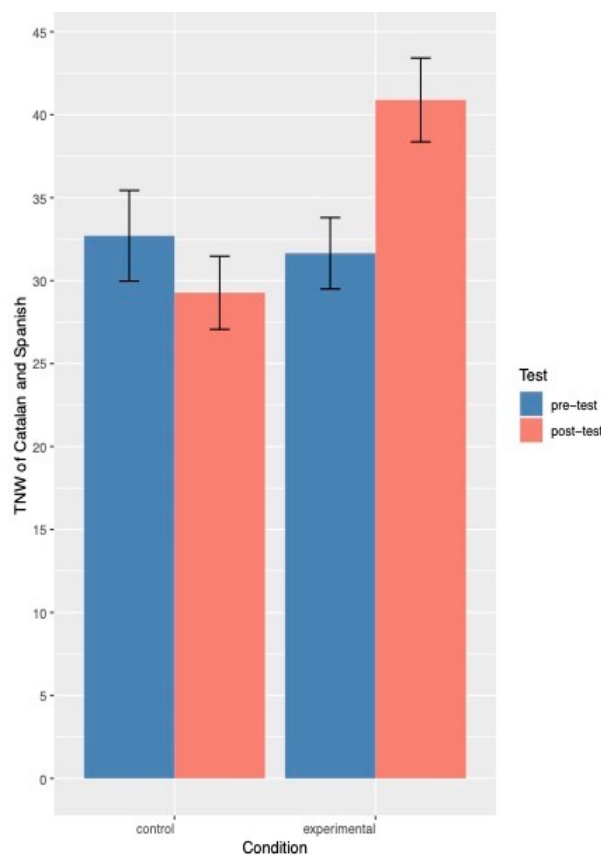


Figure 3. Mean of the TNW of Catalan and Spanish language use in the Narrative Retelling Task, broken down by condition (control vs. experimental) and test (pre-test vs. post-test). Bars indicate standard error.

The model assessing total number of words (TNW) in Catalan showed that there were significant main effects of Test ( $\chi^2(1) = 4.377$ ;  $p = .0364$ ), of Condition ( $\chi^2(1) = 8.771$ ;  $p =$

.0031), as well as between Test and Condition ( $\chi^2(1) = 7.4672$ ;  $p = .0063$ ). The post-hoc pairwise comparisons were also found to be significant indicating for Test ( $t(72) = 2.0925$ ;  $SE = 1.9$ ;  $p = .04$ ) and for Condition ( $t(72) = -2.962$ ;  $SE = 3.4$ ;  $p = .004$ ). There was also a significant improvement from pre-test to post-test in the experimental group ( $t(72) = -3.412$ ;  $SE = 2.8$ ;  $p = .00043$ ), while the control group did not show any improvements ( $p = 1$ ). The interaction also suggested that at post-test the experimental group had significantly higher scores than the control group ( $t(116) = -3.935$ ;  $SE = 3.94$ ;  $p = .0006$ ), while there were no significant differences at pre-test between control and experimental groups ( $p = .9598$ ) (see Figure 4 below).

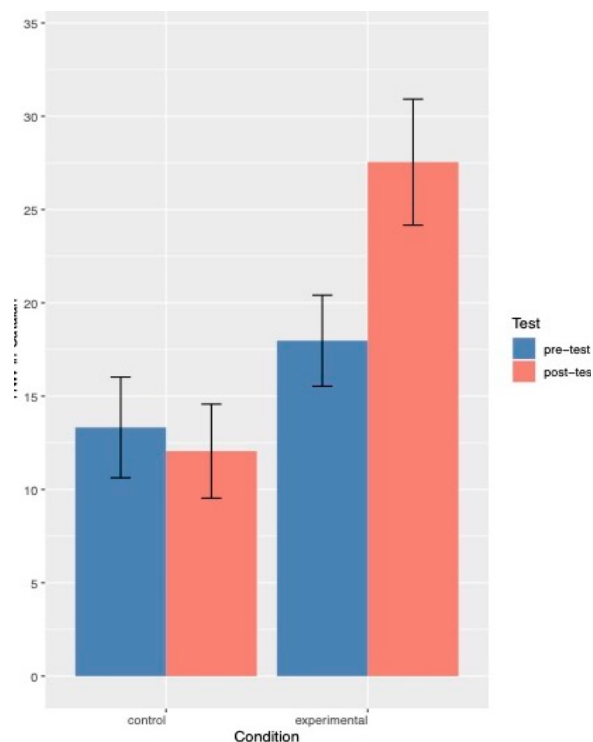


Figure 4. Mean of the TNW of Catalan language use in the Narrative Retelling Task, broken down by condition (control vs. experimental) and test (pre-test vs. post-test). Bars indicate standard error.

The model assessing total number of words (TNW) in Spanish showed no significant main effects of Test ( $p = .2895$ ), nor Condition ( $p = .1219$ ), nor a significant interaction between Test and Condition ( $p = .068$ ), indicating that there were no significant differences between the two groups at pre-test nor at post-test. (see Figure 5).

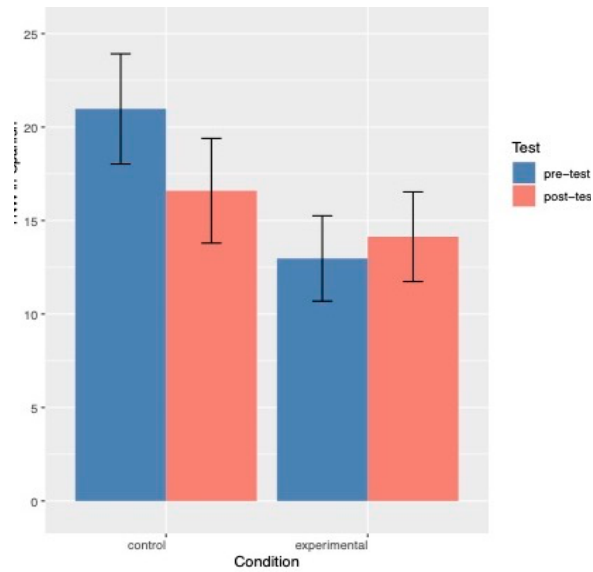


Figure 5. Mean of the TNW of Spanish language use in the Narrative Retelling Task, broken down by condition (control vs. experimental) and test (pre-test vs. post-test). Bars indicate standard error.

### 3.2 Total Number of Different Words

The model assessing the TNDW of the bilingual sample (including data from both Catalan and Spanish) showed no significant main effect of Test ( $p = .7718$ ) nor Condition ( $p = .0904$ ). The model reported a significant interaction between Test and Condition ( $\chi^2(1) = 8.488$ ;  $p = .00358$ ), showing that at post-test the experimental group had nearly significant higher scores than the control group ( $t(121) = -2.985$ ;  $SE = 1.8$ ;  $p = .0137$ ), while there were no significant differences at pre-test ( $p = 1$ ). No significant improvements from pre-test to post-test were found assessing the experimental ( $p = .2707$ ) and the control ( $p = .1061$ ) groups separately (see Figure 6).

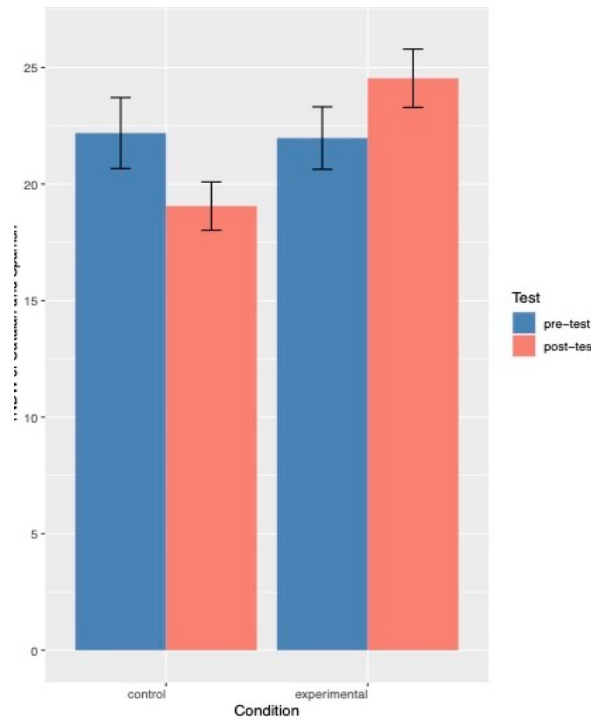


Figure 6. Mean of the TNDW of Catalan and Spanish language use in the Narrative Retelling Task, broken down by condition (control vs. experimental) and test (pre-test vs. post-test). Bars indicate standard error.

The model assessing the total number of different words (TNDW) in Catalan showed no significant main effects of Test ( $p = .4131$ ). A significant main effect was found of Condition ( $p = .0025$ ), which was confirmed with post-hoc pairwise comparisons ( $t(72) = -3.024$ ;  $SE = 1.9$ ;  $p = .0035$ ). A significant interaction between Test and Condition was also reported ( $\chi^2(1) = 6.1544$ ;  $p = .0131$ ), indicating that at post-test the experimental group had significantly higher scores than the control group ( $t(110) = -3.833$ ;  $SE = 2.2$ ;  $p = .0008$ ), while there were no significant differences at pre-test ( $p = .5363$ ). No significant improvements from pre- to post-test were found for each group separately (experimental group:  $p = .0898$ ; control group:  $p = .9747$ ) (see Figure 7).

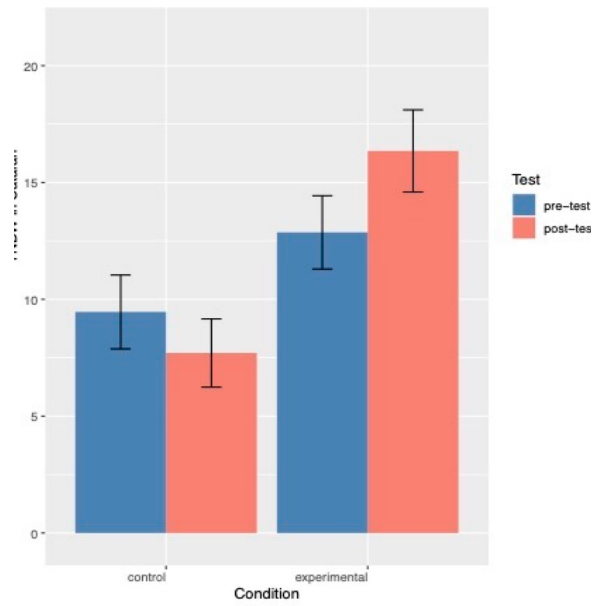


Figure 7. Mean of the TNDW of Catalan language use in the Narrative Retelling Task, broken down by condition (control vs. experimental) and test (pre-test vs. post-test). Bars indicate standard error.

The model assessing the total number of different words (TNDW) in Spanish showed no significant effects of Test ( $p = .1806$ ), nor Condition ( $p = .0841$ ), nor a significant interaction between Test and Condition ( $p = .1316$ ), indicating that there are no significant differences between the two groups at pre-test nor at post-test (see Figure 8).

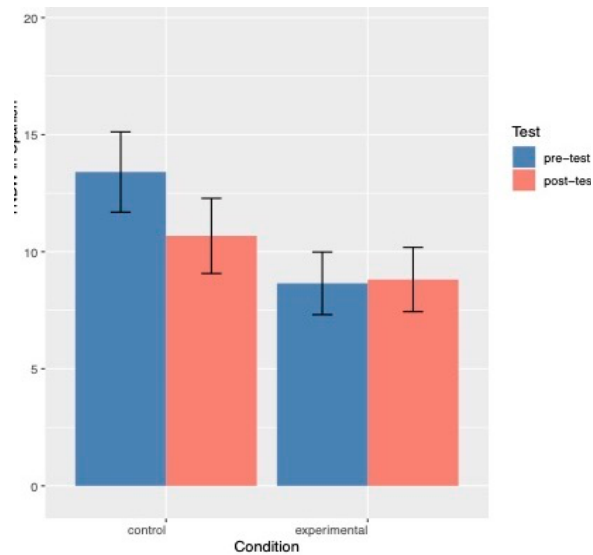


Figure 8. Mean of the TNDW of Spanish language use in the Narrative Retelling Task, broken down by condition (control vs. experimental) and test (pre-test vs. post-test). Bars indicate standard error.

#### 4. Discussion

The findings of this study suggest that the application of a 9-session narrative-based intervention in Catalan has the potential to improve preschoolers' narrative microstructure, specifically in terms of word productivity, after training. The two hypotheses were validated, as the use of both Catalan and Spanish in narrative retellings led to significant improvements in the total number of words (TNW) and the total number of different words (TNDW) variables from pre-test to post-test. However, when analyzing the use of individual languages, significant improvements in TNW and TNDW variables were observed only for Catalan, while no significant improvements were observed for Spanish.

First, with respect to TNW, the experimental group, which received the narrative intervention, demonstrated a significant enhancement in TNW from pre-test to post-test, using more words in both Catalan and Spanish compared to the control group. Additionally, at post-test, the experimental group's TNW scores were significantly higher than those of the control group. These findings suggest that the narrative-based intervention positively impacted the total number of words used by the children in the experimental group. In contrast, the control group did not show a significant change in their total number of word scores. Regarding TNDW, the experimental group exhibited a greater diversity of words in their narratives compared to the control group at post-test. This indicates that the intervention had a notable effect on the experimental group's ability to use a wider range of words in their storytelling, leading to richer and more varied narratives. On the other hand, there were no significant differences in TNDW scores observed between the experimental and control groups when considering each group individually or comparing pre-test and post-test scores. These results suggest that the intervention had a specific impact on the experimental group's use of a greater variety of words in their narratives compared to the control group.

Regarding the separate analysis of Catalan and Spanish, the results showed significant improvements in TNDW and TNW for the bilingual sample, with more pronounced effects observed in the non-dominant language, Catalan. These findings further support the potential benefits of narrative interventions with the non-dominant language in enhancing word productivity and diversity, particularly in the context of the non-dominant language of bilingual individuals. By focusing on the specific outcomes of TNDW and TNW, this study expands upon the existing literature and emphasizes the significance of considering language context in



language interventions. It is worth noting that future research should investigate whether similar improvements in the non-dominant language can be observed in contexts where Catalan is more dominantly used. This proposed exploration would shed light on the generalizability of the training effects and deepen our understanding of the impact of narrative interventions on language development in bilingual settings.

As previously mentioned, earlier studies have highlighted the numerous advantages of narrative-focused instruction on enhancing the complexity of stories and linguistic elements (Petersen et al., 2010). Moreover, engagement in narratives has been associated with improvements in social skills and academic performance (Lanvers, 2001; Prevoo et al., 2016). By integrating the first language into instructional practices, cross-language interactions and knowledge transfer can be facilitated (Pico et al., 2021). These findings underscore the importance of narratives as a powerful tool for studying language development, as they provide opportunities for natural language production (Pico et al., 2021). Furthermore, narrative interventions have been found to enhance lexical productivity and diversity. Augmentative communication devices have been found to enhance both the complexity of stories and linguistic aspects (Soto et al., 2009). Development of oral language and narratives has been linked to benefits in linguistic, social, and academic abilities (Albirini et al., 2011; Montrul, 2010). Strategic instruction in the first language has also been found to facilitate knowledge transfer to the second language (Spencer & Petersen, 2020). Additionally, narrative schemas have been found to aid in comprehension and information organization (Anderson & Pearson, 1984; MacWhinney, 1999).

Considering these insights, a narrative-based intervention holds great potential in enhancing lexical productivity and diversity among non-dominant bilingual preschoolers. The findings emphasize the importance of designing language interventions that take into account the language context, particularly in promoting the development of the non-dominant language in bilingual individuals.

It is worth noting that previous research, as highlighted in Richards (1987) and Hess et al (1989), argues against using Type/Token Ratio (TTR) as a reliable and accurate measure for assessing children's oral speech production. Richards (1987) emphasizes that TTR's weighting of vocabulary range based on sample size assumes that a larger sample size would yield more

tokens. However, any increase in tokens due to factors like mean length of utterance or rate of speech (i.e., talkativeness) automatically reduces TTR's development. Consequently, this can create an apparent decrease in lexical diversity over time, undermining TTR's validity as a measure of vocabulary range. Additionally, Hess et al. (1989) conducted a study to explore the reliability of TTR using oral language samples from elementary school children. Their findings revealed that TTRs were not comparable when calculated for different sample sizes ranging from 50 to 600 words. Moreover, within the same sample size, the reliability coefficients for each TTR measure were inconsistent and not statistically significant. These findings underscore the lack of reliability and comparability of TTRs as measures for assessing children's oral speech production. Considering the arguments and evidence presented in previous research, it was decided not to include TTR in the current analyses. The concerns raised regarding its reliability, the impact of sample size on its calculation, and its limited ability to capture vocabulary range collectively indicate the need to explore alternative measures for accurately assessing children's oral speech production.

It is important also to acknowledge the limitations of this study. Firstly, to obtain a more accurate understanding of participants' language dominance, it is crucial to ensure that all parents actively participate in filling out the questionnaires and provide responses in a consistent format. We must avoid the issue of incomplete or incorrect parental questionnaire responses. Secondly, incorporating a standardized language test for the pre-assessment and pre-intervention phases could be beneficial. By using a standardized test, researchers can potentially obtain a more objective measure of participants' language dominance and proficiency. This can aid in categorizing participants accurately and establishing a solid baseline for comparison before the intervention takes place. Integrating standardized tests into the study design would enhance the reliability and validity of the findings, providing a clearer understanding of the participants' language abilities. It would also be beneficial to include a delayed post-test as part of our study design. This additional assessment would involve administering the same tests to children several months after the initial post-test, allowing us to examine the long-term impact of the intervention.

Other limitations, such as the relatively small sample size ( $n = 74$ ) and potential unmeasured factors may have affected the outcomes of this study. For example, the observed impact of the macrostructure-focused narrative intervention on lexical microstructure suggests the need for

future research to explore additional microstructure factors such as the two basic syntactic measures: mean length of C-Units/utterances (MLCU), total number of C-Units (TNCU), as well as code-switching and code-mixing as a strategy to fill lexical gaps (Bernardini & Schlyter, 2004; Nicoladis & Secco, 2000). To enhance the validity and generalizability of these findings, future research should consider larger participant groups or employ more extensive analysis methods. Conducting further investigations would provide a more comprehensive understanding of the effects of narrative-based interventions on preschoolers' linguistic microstructure and strengthen the reliability of the conclusions drawn from the analysis. Addressing these limitations and expanding the scope of analysis would enhance the overall quality of the study, enabling researchers to gain more precise insights into participants' language dominance and the effectiveness of the intervention.

## **5. Conclusion**

In conclusion, the findings suggest that a narrative-based intervention shows promise for improving certain aspects of preschoolers' linguistic microstructure, particularly the total number of words used in narratives. Importantly, the intervention yielded statistically significant improvements in TNW and TNDW specifically for the Catalan language, while no significant improvements were observed for Spanish. These results are in line with the design of the experiment, as the children were encouraged to speak in Catalan (i.e., the non-dominant language in this context) and the researcher spoke exclusively in Catalan. This further highlights the potential benefits of the intervention in enhancing word productivity and diversity in narratives, particularly in the context of the non-dominant language, Catalan. However, further research is needed to confirm these findings, explore the potential impact on other language measures, and address the limitations of the current study.

Understanding the development of linguistic microstructure in non-dominant bilinguals is vital for gaining insights into simultaneous language acquisition and children's language skill development. This research contributes to the existing literature on narrative-based language interventions for unbalanced bilingual children. By examining the impact of the intervention on the development of the non-dominant language's linguistic microstructure, the study has provided valuable insights for educational practices and policies. The findings have noteworthy implications for optimizing language support and intervention strategies for bilingual

preschoolers, with the ultimate goal of enhancing their language skills in the non-dominant language Catalan.

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## Appendices

### Appendix 1. CLAN annotations for transcriptions

Code	Meaning	Example
www	Untranscribed material (p. ex., child's name). Tier %exp must be added.	*INV: www m'expliques la història? %exp: diu el nom de CHI.
xxx	Unintelligible speech	el ratolí havia trobat xxx
&-word	Disfluency	i va agarrar la pilota &-eh el pato i la tovallola
word [/] word	Speaker repeats one word	i [/] i se havia caigut
<words> [/] words	Speaker repeats more than 1 word	<se havia> [/] se havia caigut
word [: word(s)]	Replacement of a word (e.g., count clitics attached to a word as 2 words)	l'elefant [: el elefant] trepitja la mànega
word [//]	Speaker corrects one word	agafo [//] agafa
<words> [//]	Speaker corrects more than 1 word	<jo agafo> [//] ell agafa
word [?]	Best guess: transcriber is unsure	se le [?] ponía el elefante
<word > [?]	Best guess with more than 1 word	<se le> [?] ponía el elefante
+//	Speaker interrupts their speech	i s'havia ficat a la ba +//. (no acaba de dir "banyera")
+/	Another interlocutor interrupts speaker's speech	*CHI: pero se se+//.. *INV: molt bé. *CHI: pero se seca.
[>] [<]	Overlap between speakers	*INV: mhm [>] . *CHI: <havia> [<] agafat altres coses.
"words"	Short quotation	*CHI: i el ratolí deia 'mmmm' perquè estava enfadat.
word@o	onomatopoeia	I fa fffuuuu@o
(.)	Unfilled pause	hi havia un animal (.) que era un rató
[- lang]	inter-sentential code-switch	CHI: el ratolí estava estenent la roba. CHI: [- spa] y se cayó.
word@s:spa or @s:cat	intra-sentential code-switch	CHI: el nen penjava la ropa@s:spa.

**Appendix 2. Subset of questions from the LEAP-Q questionnaire for children in Catalan.**

1. Si us plau, indiqueu les llengües que sap el seu fill/a en ordre de DOMINI (p. ex., 1. català 2. castellà 3. anglès).
2. Si us plau, indiqueu les llengües que sap el seu fill/a en ordre de d'ADQUISICIÓ (la seva llengua materna primer) (p. ex., 1. català 2. castellà 3. anglès).
3. Si us plau, indiqueu el percentatge de temps que actualment i de mitjana FA SERVIR el seu fill/a cada llengua (Van respondre primer per català segon per castellà).
  - 0-25%
  - 26-50%
  - 51-75%
  - 76-100%
4. Si us plau, indiqueu el percentatge de temps que actualment i de mitjana ESCOLTA el seu fill/a cada llengua (Van respondre primer per català segon per castellà).
  - 0-25%
  - 26-50%
  - 51-75%
  - 76-100%
5. Si ha marcat "Altra llengua" en les dues preguntes anteriors, especifiqueu quina és?
6. Si us plau, marqui el nivell d'habilitat del seu fill/a per a parlar i entendre el CATALÀ.
  - Perfecte, Excel·lent, Molt bo, Bo, Una mica més que Adequat, Adequat, Una mica menys que Adequat, Just Maix, Molt baix
    - Parlar
    - Entendre
7. Si us plau, marqui el nivell d'habilitat del seu fill/a per a parlar i entendre el CASTELLÀ.
  - Perfecte, Excel·lent, Molt bo, Bo, Una mica més que Adequat, Adequat, Una mica menys que Adequat, Just Maix, Molt baix
    - Parlar
    - Entendre

### Appendix 3. Script of the narrative retelling task

(Florit-Pons, 2022)

1. [Abans de començar] *Examinador*: “Ara hauràs de mirar uns dibuixos animats. Mira’ls molt atentament. Quan acabi el vídeo, m’hauràs d’explicar aquesta història a mi i jo hauré d’endevinar quina història m’has explicat. Estàs llest/a?”
2. Videos to watch for each assessment:
  - Pre-test: Löchersocken.  
(<https://www.wdrmaus.de/filme/mausspots/loechersocken.php5>).
  - Post-test: Gitarre (<https://www.wdrmaus.de/filme/mausspots/gitarre.php5>).
3. [Quan ha acabat de veure el vídeo] *Examinador*: “Ja ha acabat? Ara posa’t dret i m’expliques la història que has vist.”
4. Si sembla que vol acabar, però encara no ha explicat tota la història se li pot dir: “I què més? Ha passat alguna cosa més?”
5. [Quan sembla que el nen ha acabat] *Examinador*: “Ja està?”. “Molt bé, a veure a veure, crec que ja sé quina història m’has explicat” (mostrem les imatges i assenyalem la que ha mirat)”

Prompt català: "Recordes el que t'he dit abans? Jo només parlo català i em costa molt entendre el castellà. M'ajudaràs perquè t'entengui i em parlaràs en català?"

Si durant la tasca parla molt en castellà: “No t’entenc, m’ho pots dir en català?”