Narrative Skills in Bilingual Children: The Impact of Shared and Language-Specific Skills

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Abstract

Despite increasing research on bilingual narratives, it remains unclear whether macrostructure is shared across bilinguals' two languages, how microstructure supports macrostructure within each language, and whether language dominance influences these relations. This study examined cross-language macrostructure, microstructure–macrostructure associations, and the moderating role of language dominance. Participants were 64 Grade 1 (Mage = 7;2 years) Greek–German bilingual children who completed a picture-based narrative task in both languages. Macrostructure was assessed using story structure, while microstructure was measured through total number of words (TNW), lexical diversity (VOC-D), mean length of utterance (MLU), and clausal density (CD). Language dominance was operationalized as relative vocabulary proficiency in Greek and German. Results showed a partial cross-language macrostructure association and significant contributions of microstructure to macrostructure in both languages, with no moderation effects of dominance. TNW emerged as the strongest and most consistent predictor. Findings highlight shared cognitive and language-specific factors supporting narrative macrostructure.

Keywords: oral narrative; microstructure; macrostructure; language dominance; Greek-German bilingual children;

Introduction

Children produce narratives by simultaneously integrating multiple levels, including macrostructure (i.e., the overall organization of a story at the conceptual level) and microstructure, which reflects the linguistic resources used to express that story through lexical and morphosyntactic features (Liles et al., 1995; Miller et al., 2006). Bilingual children provide a unique opportunity for examining these processes, as the same individual must produce a narrative structure across two different linguistic systems. This raises questions as to whether narrative macrostructure is shared across a bilingual's two languages and the extent to which language-specific microstructural resources influence its expression. The current study addressed these questions by investigating narrative macrostructure in both languages of Greek-German bilingual children.

Macrostructure across languages

Narrative macrostructure refers to the global, higher-level organization of a story that extends beyond the utterance level and enables events of the story to be expressed in a coherent whole (Heilmann et al., 2010). Particularly, macrostructure captures how narrators introduce settings, establish characters' goals, and organize events into episodes.

Several frameworks have been proposed to assess macrostructure with the most prevalent one being the story grammar model (Stein & Glenn, 1979). Across frameworks, macrostructure traditionally includes core components, such as settings (time, place and introduction of the protagonist) and an episodic system (goal, attempt, outcome), centered around the protagonist's goal. In more recent approaches, macrostructure measures may also include the presence of mental states, describing the characters' intentions together with the core episodic structure (Gagarina et al., 2019). In the current study, narrative macrostructure is operationalized using story structure (SS), as defined within the multidimensional model of narrative organization (MAIN; Gagarina et al., 2012, 2019).

From a cognitive perspective, macrostructure reflects the higher-order universal structures (cognitive schemata) that guide the organization of a story (Stein & Glenn, 1979) and it is therefore often considered to be language-independent (Heilmann et al., 2010; Kupersmitt & Berman, 2001). In bilingual children, these schemata are hypothesized to be shared across languages, such that some macrostructure elements in one language could be used to structure a story in the other language (Bohnacker et al., 2022; Paradis et al., 2011). This view aligns with the cross-linguistic transfer hypothesis (Cummins, 1979), which posits that language-independent skills can transfer across a bilingual's two languages.

Empirical findings, however, are mixed. While several studies report cross-language associations in narrative macrostructure (Altman et al., 2016; Fiani et al., 2022; Fiestas & Peña, 2004; Granados Vargas et al., 2024; Pearson, 2002), others find weak or absent relations between bilinguals' two languages (Kapalková et al., 2016; Squires et al., 2014; Tribushinina et al., 2022). These inconsistencies highlight the need to further examine whether macrostructure reflects cognitive representations shared across bilinguals' two languages.

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Macrostructure and microstructure associations

Beyond potential cross-linguistic relations, narrative macrostructure is also theorized to depend on the language-specific lexical and grammatical resources of the language (Iluz-Cohen & Walters, 2012; Lucero, 2015). From this perspective, narrative microstructure provides the building blocks that enable the production of higher-level macrostructure (Berman & Slobin, 1994; Heilmann et al., 2010; Justice et al., 2006).

Empirical studies have consistently shown that lexical productivity measures, often indexed by narrative length, are robust predictors of macrostructure in both monolingual and bilingual children (Bohnacker et al., 2022; Heilmann et al., 2010; Lindgren & Bohnacker, 2022). Likewise, lexical diversity plays a crucial role in narrative organization, with measures, such as the number of different words (NDW) or vocabulary diversity (VOC-D), predicting macrostructure across languages and age groups (Bitetti et al., 2020; Granados Vargas et al., 2024; Košutar et al., 2022).

In contrast, findings regarding syntactic contributions to macrostructure are less consistent and come from languages with different typological systems (e.g., Croatian, Spanish, English). While some studies report that syntactic complexity, measured by clausal density (CD), predicts macrostructure particularly in older children (Košutar et al., 2022), others find no associations (Heilmann et al., 2010). Research in bilinguals similarly suggests that syntactic complexity measures, such as mean length of utterance (MLU), predicts macrostructure in both languages of bilinguals (Bitetti et al., 2020), with effects being more robust in the dominant language (Lucero, 2015).

Taken together, these findings generally suggest that as children develop, increases in lexical and syntactic complexity co-occur with more advanced SS, thus strengthening the link between microstructure features and macrostructure organization (Heilmann et al., 2010; Košutar et al., 2022). At the same time, inconsistencies across studies point to cross-linguistic differences in how syntactic complexity is measured across languages with different typological systems. In bilingual children, such variability suggests that the availability and influence of microstructure resources on macrostructure may depend on language experience or proficiency in that language. This highlights the need to examine how multiple microstructure features jointly relate to macrostructure across both languages of bilingual children.

Language dominance and within-language narrative microstructure and macrostructure associations

Although microstructure is known to support narrative macrostructure, the degree to which macrostructure depends on microstructural resources may vary as a function of language dominance. Language dominance refers to the relation between bilingual children's two languages (Treffers-Daller, 2011). Some bilingual children demonstrate greater proficiency in one language relative to the other (dominant bilinguals), whereas others show more balanced abilities across the two languages (Silva-Corvalán & Treffers-Daller, 2016). Such variation in dominance is reflected in children's linguistic performance across their two languages (Fichman et al., 2022).

A handful of studies on Spanish–English bilingual children have examined whether associations between microstructure and macrostructure differ as a function of language dominance. These studies hypothesized that children who are dominant in one language would exhibit stronger microstructure–macrostructure associations in their weaker language (Bitetti et al., 2020; Lucero, 2015; Montanari, 2004). This expectation is based on the assumption that bilingual children may possess knowledge of narrative structure but may lack the linguistic resources required to express that structure in their weaker/less developed language (Tribushinina et al., 2022). Consequently, macrostructure performance in the weaker/less developed language is thought to be highly dependent on available microstructure skills.

Despite these predictions, existing studies have not provided clear evidence that language dominance moderates the relationship between microstructure and macrostructure. For example, Bitetti et al. (2020) operationalized language dominance as the proficiency gap between the two languages and reported no moderating effects on microstructure–macrostructure associations in either Spanish or English.

Overall, findings remain scarce and inconclusive; moreover, previous studies have often operationalized language dominance categorically (Bitetti et al., 2020; Lucero, 2015), which may reduce sensitivity to individual variation in bilingual language experience. In contrast, recent approaches emphasize examining dominance as a continuous construct (Luk & Bialystok, 2013).

The present study

Despite evidence that narrative macrostructure may be shared across languages, little is known about how microstructure contributes to macrostructure within each language and whether this relationship is shaped by bilinguals' language dominance.

The present study addressed these gaps by examining narrative skills in both languages of Greek–German bilingual children. Narrative macrostructure was assessed using SS scores from the MAIN (Gagarina et al., 2012, 2019). Microstructure was indexed by lexical measures: TNW, VOC-D and grammatical measures: MLU, CD. Language dominance was operationalized as a continuous measure reflecting the difference in expressive vocabulary scores between Greek and German. Specifically, we aimed at answering the following research questions (RQ):

1) Are narrative macrostructure skills related across bilinguals' two languages?

We hypothesized that macrostructure performance would be positively correlated across Greek and German, reflecting shared narrative knowledge across languages.

2) A) Does microstructure predict narrative macrostructure in Greek and German?
B) Is this relationship moderated by language dominance?

We expected microstructure measures to be associated with macrostructure in both languages. Furthermore, we hypothesized that language dominance would moderate these associations, such that macrostructure would show greater dependence on microstructure in the less dominant language, reflecting differences in the availability of language-specific resources for narrative organization.

Methods

Participants

We recruited 64 Greek-German bilinguals (females = 39) at the end of Grade 1 (age = 6;2 – 8;01 years, *M* = 7;2 years, *SD* = 0;5). All children had at least one parent of Greek descent and they were attending German monolingual schools and Greek heritage courses in the afternoon. All children had non-verbal intelligence within the norms and no history of neurodevelopmental disorders. The children's mean age of onset (AoO) of bilingualism in German was 8.23 months (SD = 12.38) with a range 0 – 48 months. Out of the 64 children, four were excluded from the Greek dataset (N = 60), and one was excluded from the German one (N = 62) because they did not produce a story in the respective language.

The study was approved by the Research Ethics Committee of Humboldt University, and it was carried out in accordance with the ethical standards laid down in the Declaration of Helsinki.

A language proficiency test was administered for both Greek and German with parallel measures, i.e. the expressive vocabulary from the Cross-Linguistic Lexical Task (CLT; Haman et al., 2015). Two subtasks were used, measuring noun and verb production, respectively. Each subtask consists of 32 randomized items. The child is asked to name each picture presented to them. The first two are practice items. The total number of correct answers is used as the raw score.

Language dominance was defined as relative proficiency between the two languages and indexed as a continuous measure based on the difference between children's total expressive vocabulary scores in German and Greek (Silva-Corvalán & Treffers-Daller, 2016). Vocabulary scores were standardized (*z*-scored) within each language prior to computing language dominance to control for potential cross-linguistic differences in test difficulty. Specifically, the Greek vocabulary *z*-score was subtracted from the German *z*-score, with values close to zero indicating balanced proficiency, positive values reflecting German dominance, and negative values reflecting Greek dominance. Language dominance in our sample ranged from -3.76 to 2.90 (*M* = -0.11, *SD* = 1.64).

Materials

LITMUS MAIN: Oral narrative production ("telling") was elicited via a picture-based assessment tool, the LITMUS MAIN (Gagarina et al., 2012, 2019) in both Greek and German using the "Cat" and "Dog" stories in both languages. The two stories are parallel in terms of number of pictures (six), episodic structure (three episodes) and the number and type of characters (three characters), thus allowing for cross-language comparisons.

Procedure

Parents gave their written consent and filled in the parental questionnaire at home. The children were tested in a quiet environment at school or at home in two sessions, one for each language with an interval of at least 4 days between the languages. The testing was performed in a monolingual mode by trained experimenters who were native speakers of either Greek or German. The two sessions lasted approximately 20-25 minutes each and included the language proficiency test and the narrative elicitation procedure. The order of the language (Greek/German) as well as the stories (Cat/Dog) were counterbalanced to avoid any confounding order effect. The sessions were audio recorded and then transcribed verbatim with the CHAT-format (MacWhinney, 2000). The transcriptions were double-checked by a second trained coder, and all disagreements were resolved through consensus.

Narrative measures and analyses

Macrostructure was assessed with SS following the MAIN protocol. The scoring included the setting (time, place; 2 points) and one point for each of the five episodic components (initiating internal state, goal, attempt, outcome, resulting internal state) across three episodes (5 episode components × 3 episodes = 15 points). The maximum possible SS score was therefore 17 points.

Microstructure included four measures. Lexical productivity was measured by the Total Number of Words (TNW) used in the narrative, using the *freq* command of the CLAN program (MacWhinney, 2000). Lexical diversity was calculated using VOC-D in CLAN (vocd command). Unlike traditional Type–Token–Ratio measures, VOC-D applies random sampling and curve-fitting procedure across token samples of 35-50 words (100 trials per sample) to provide a *D* value that is relatively independent of the narrative length (Malvern et al., 2004). The procedure requires a minimum of 50 tokens to converge.

Grammatical productivity was indexed as Mean Length of Utterances in words (MLU-w), computed automatically in CLAN as the ratio of word tokens to utterances. Finally, Clausal Density (CD) indexed grammatical complexity and was calculated as the number of main and subordinate clauses divided by the number of C-units[1]; in Greek, clauses with omitted subjects were included due to its pro-drop nature.

[1] A C-unit includes a main clause and all its subordinate clauses used in an utterance (Loban, 1976).

All analyses were run in R (version 4.3.2, 2023). We first calculated Pearson correlations to examine the relationship of macrostructure across the two languages (RQ1). Then, we conducted multiple regressions separately for each language (RQ2A) with SS as the outcome variable and each microstructure measure (i.e., TNW, VOC-D, MLU-w, CD) as independent variables, while age was entered as a control variable. All independent and control variables were centered around their means. Finally, in the last model (RQ2B), we inserted language dominance and the interactions between language dominance and each of the four microstructure variables in the multiple regressions to examine whether the relationship between micro- and macrostructure differs as a function of language dominance. Variance inflation factors (VIF) for all predictors were within acceptable limits (VIF < 3), suggesting absence of multicollinearity issues. Missing data for the independent variables were six for VOC-D values (Greek = 5 and German = 1) and four for language dominance (German: n = 3; Greek: n = 1). Missing VOC-D values arose from narratives falling below the vocd threshold of 50 tokens (TNW) and thus they could not be estimated. Missing language dominance values occurred because vocabulary was not tested in the respective language. These cases were assumed to be Missing at Random (MAR) and were handled using multiple imputations via the *mice* package in R (van Buuren & Groothuis-Oudshoorn, 2011). All predictors and outcome variables were included in the imputation model. We generated m = 50 imputations via predictive mean matching[2]. Data and code are available here: https://osf.io/78fqe/.

Results

Table 1 shows descriptive statistics for the narrative macrostructure and microstructure in both languages. Overall, children performed better in narrative macrostructure in German than in Greek, as indicated by the mean. The same was true for all microstructure features, except for CD in which children produced slightly more clauses within a C-unit in Greek than in German. The following sections report on results for each research question.

Macrostructure Across Languages

Regarding the shared variance between Greek and German macrostructure (RQ1), results showed a moderate positive correlation, r(56) = .29, p = .03, 95% CI [.03, .51], indicating that performance in SS in one language explained 8.4% of the variation in the other language (see Figure 1).

[2] Complete-case analysis confirms the robustness of the main findings in terms of both direction and relative magnitude of the predictors, except for MLU-SS associations in German model which became non-significant (available at OSF).

Table 1: Mean descriptive scores (standard deviations) for variables across Greek and German.

Variables	Greek	German
	Mean (SD) [Min, Max]	Mean (SD) [Min, Max]
Age (months)	–	85.97 (4.70) [76.00 – 96.50]
TNW	85.46 (33.35) [5 – 175]	108.33 (37.89) [39 – 259]
VOC-D	30.53 (14.57) [6.48 – 66.65]	31.69 (9.83) [15.46 – 68.75]
MLU-w	6.47 (1.26) [3.23 – 10.20]	7.45 (1.34) [4.60 – 13.00]
CD	1.40 (1.26) [0.67 – 2.40]	1.12 (0.19) [0.00 – 1.60]
SS	6.38 (2.26) [0 – 11]	7.32 (2.19) [0 – 13]
Lang. Prof.	35.48 (14.16) [5 – 57]	50.70 (6.01) [37 – 59]

Note. TNW = Total Number of Words; VOC-D = lexical diversity; MLU-w = Mean Length of Utterance; CD = Clausal Density; SS= Story Structure; Lang. Prof. = Language Proficiency based on the expressive vocabulary

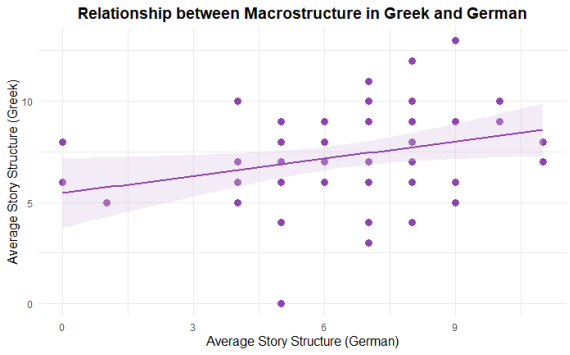

Figure 1: Correlation of macrostructure in Greek and German. Shared region represents 95% of confidence interval.

Predictors of Macrostructure in Greek and German

To examine microstructure and macrostructure associations, multiple regression analyses were conducted separately for Greek and German macrostructure (SS).

For Greek, SS was strongly and positively predicted by TNW (β = 0.56, SE = 0.01, p < .001) and VOC-D (β = 0.25, SE = 0.02, p = .03). Age, MLU-w and CD were not significant predictors. The overall model explained 46% of the variance in Greek SS.

For German, TNW was likewise a strong and significant predictor of SS (β = 0.67, *SE* = 0.01, *p* < .001). In addition, MLU-w was negatively associated with SS (β = –0.23, *SE* = 0.17, *p* = .04), indicating that the production of more complex grammatical sentences was associated with lower macrostructure scores. Diagnostic checks confirmed the validity of this model; VIFs were at acceptable limits and the negative raw correlation between MLU and SS (r = –0.06) indicated that this association was not an artefact but rather reflected the contribution of grammatical production to macrostructure.

Age, VOC-D, and CD were not significant predictors. The overall model accounted for 50% of the variance in German SS.

Table 2 summarizes the regression results for both languages.

Table 2: Regression results for macrostructure across Greek and German.

Predictor	Greek β	*p*	German β	*p*
Age	−0.14	.176	0.09	.377
TNW	**0.56**	**< .001**	**0.67**	**< .001**
VOC-D	**0.25**	**.027**	−0.03	.762
MLU-w	−0.04	.786	**−0.23**	**.040**
CD	0.02	.853	0.11	.308
R²	**.46**		**.50**	

Note. TNW = Total Number of Words; VOC-D = lexical diversity; MLU-w = Mean Length of Utterance; CD = Clausal Density

Significance levels at * p < .05, ** p < .01, *** p < .001 are bold.

Language Dominance as a Moderator in the Microstructure – Macrostructure Associations

A second set of models examined whether the relationship between microstructure and macrostructure was moderated by language dominance. Language dominance was entered as a continuous predictor, along with interaction terms between dominance and each microstructure measure (i.e., TNW, VOC-D, MLU-w, CD).

For Greek SS, TNW remained a significant positive predictor (β = 0.48, *SE* = 0.01, *p* < .001). Language dominance also showed a significant negative main effect (β = −0.31, *SE* = 0.19, *p* = .03), indicating that greater German dominance was associated with lower Greek macrostructure performance. Importantly, no interaction effects between language dominance and any microstructure variable reached significance. Overall, the absence of significant interaction effects indicates that language dominance influenced overall macrostructural performance but did not alter the strength of microstructure–macrostructure relations. The model explained 55% of the variance in Greek macrostructure.

For German SS, TNW was again the only significant predictor (β = 0.66, *SE* = 0.01, *p* < .001). Language dominance, MLU-w, VOC-D, CD, and all interaction terms were non-significant. This model explained 52% of the variance in German SS.

Table 3 presents the full results for the moderation analyses in both languages.

Table 3: Language dominance as a moderator.

Predictor	Greek β	*p*	German β	*p*
Age	−0.07	.547	0.09	.399
TNW	**0.48**	**< .001**	**0.66**	**< .001**
VOC-D	0.06	.637	−0.05	.721
MLU-w	−0.13	.361	−0.19	.184
CD	0.09	.585	0.05	.738
Dom	**−0.31**	**.026**	0.04	.685
TNW × Dom	0.01	.967	−0.08	.484
VOC-D × Dom	0.01	.953	0.09	.485
MLU-w × Dom	0.11	.482	−0.15	.261
CD × Dom	0.04	.814	0.06	.672
R²	**.55**		**.52**	

Note. TNW = Total Number of Words; VOC-D = lexical diversity; MLU-w = Mean Length of Utterance; CD = Clausal Density; Dom = Language Dominance

Significance levels at * p < .05, ** p < .01, *** p < .001 are bold.

Discussion

The study aimed at investigating whether macrostructure is shared across languages of bilinguals and how microstructure contributes to macrostructure within each language of Greek-German bilingual children at Grade 1. Additionally, it examined whether this relationship is shaped by bilinguals' language dominance.

With respect to cross-language associations across macrostructure, results revealed a modest correlation between Greek and German macrostructure, with approximately 8% of the variance in one language explained by performance in the other. This finding aligns with previous research on bilingual narratives (e.g., Altman et al., 2016; Bohnacker et al., 2022; Fiestas & Peña, 2004; Granados Vargas et al., 2024; Pearson, 2002), which suggests that macrostructure is partially shared in bilinguals' languages. Such cross-linguistic consistency is commonly attributed to shared narrative schemas and conceptual organization that draws on domain-general knowledge of SS (Berman & Slobin, 1994). The present results are therefore consistent with theoretical frameworks of crosslinguistic

transfer (Cummins, 1979), according to which higher-level discourse skills can support narrative performance across languages. At the same time, the modest magnitude of the association of macrostructure suggests that, alongside shared conceptual representations, cultural and language-specific factors could also contribute to macrostructural performance across bilinguals' two languages (cf. Tannen, 1980).

The second research question examined the role of microstructure in shaping macrostructure. Overall, microstructure accounted for 46% of the variance in Greek and 50% in German. Notably, narrative productivity, indexed by TNW, uniquely predicted macrostructure in both Greek and German, over and above other microstructure features. This consistency in findings across both languages indicates that producing longer narratives enhances the likelihood of producing higher SS scores, aligning with previous research on macrostructure (Bohnacker et al., 2022; Lindgren & Bohnacker, 2022).

Furthermore, lexical diversity, measured by VOC-D, also emerged as a significant predictor of macrostructure, but only in Greek. This result is consistent with prior studies in monolinguals (Košutar et al., 2022) and research on both monolinguals and bilinguals using measures of lexical diversity, such as the number of different words (Altman et al., 2016; Bitetti et al., 2020; Granados Vargas et al., 2024; Heilmann et al., 2010; Lucero, 2015). In contrast, VOC-D did not significantly predict macrostructure in German. This may be due to greater variability in German VOC-D scores, as reflected in the larger standard deviation, which could likely weaken the observed association. Alternatively, given the higher overall SS scores in German, other skills, such as cognitive or inferencing skills, may play a more prominent role in supporting macrostructure development.

With respect to the grammar-related measures, MLU-w showed a small negative association with SS in German only. Although previous research has reported a positive relationship between MLU-w and macrostructure in monolinguals (e.g., Bonifacci et al., 2018) and in the majority language of bilinguals (Bitetti et al., 2020; Lucero, 2015), our findings suggest a different pattern. Producing longer sentences may have required greater cognitive effort, which in turn may have detracted from the organization of the overall SS. This aligns with previous theoretical perspectives on narrative development, proposing that narrators have a finite linguistic capacity, which is connected to the "bucket" theory (Crystal, 1987). According to this theory, there are trade-offs between micro- and macrostructure. Specifically, when children focus on producing a more complex or well-organized SS, microstructure complexity, such as syntactic precision, might be reduced temporarily, and vice versa (Justice et al., 2006).

Moreover, syntactic complexity, measured by CD, showed no relation to macrostructure in either Greek or German, consistent with findings in young children (Bitetti et al., 2020; Heilmann et al., 2010; see Košutar et al., 2022 for 6-year-old monolinguals). At Grade 1, syntactic skills may still be emerging (Justice et al., 2006; Nippold, 2016), and thus, contribute less to narrative macrostructure than vocabulary or other grammatical measures (Heilmann et al., 2010; Košutar et al., 2022). Although children begin producing the grammatical forms and lexical items needed to describe events around age three, they are still developing the ability to coordinate story grammar components cohesively (Berman & Slobin, 1994).

Finally, regarding the moderating effect of language dominance on the microstructure-macrostructure relationship, results showed no significant interactions for either Greek or German. In other words, whether children were Greek- or German-dominant, or balanced, did not alter the strength of microstructure–macrostructure connections. This finding aligns with previous research on Spanish–English bilingual children, where no moderation effects were found in either the heritage or majority language (Bitetti et al., 2020; Lucero, 2015). Microstructure appears to support macrostructure consistently, irrespective of language dominance.

In our sample, limited variability at the extreme ends (few strongly Greek-dominant children) may have reduced the ability to detect slope differences, suggesting that the micro–macro relationship is generally stable across dominance profiles. However, language dominance did show an effect: higher German dominance was associated with lower Greek macrostructure scores, whereas German macrostructure was unaffected. This pattern may reflect the composition of the sample, in which most children were balanced or German-dominant. This finding is consistent with previous studies, although they employed categorical variables (Bitetti et al., 2020; Fichman et al., 2022).

Conclusions

Taken together, the current study highlights narrative macrostructure as a multidimensional construct that draws partially on a common conceptual narrative schema across bilingual's languages, while also being supported by microstructure to produce a coherent story. At this age, microstructural lexical abilities appear to play a stronger role than syntactic complexity in supporting narrative organization. Additionally, variation in language dominance does not influence the extent to which microstructure supports macrostructure. However, these results need to be replicated with other populations. These findings contribute to the growing literature on bilingual narrative development and highlight the need for future longitudinal research to examine how microstructure–macrostructure relations and language dominance effects change over time.

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