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Story grammar elements and causal relations in the narratives of Russian-Hebrew bilingual children with SLI and typical language development

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ABSTRACT

Background: While there is general agreement regarding poor performance of children with Specific Language Impairment (SLI) on microstructure measures of narrative production, findings on macrostructure are inconsistent.

Purpose: The present study analyzed narrative abilities of Russian-Hebrew bilingual preschool children with and without SLI, with a particular focus on story grammar (SG) elements and causal relations, in order to identify macrostructure features which distinguish bilingual children with SLI from those with typical development.

Method: Narratives were collected from 35 typically developing bilinguals (BiTD) and 14 bilinguals with SLI (BiSLI) in both Russian/L1 and Hebrew/L2 using a retelling procedure (*LITMUS-Multilingual Assessment Instrument for Narratives*) (Gagarina, Klop, Kunnari, Tantele, Välimaa, Balčiūnienė, Bohnacker, & Walters, 2012). Each story contained three episodes, and each episode introduced a different protagonist with explicitly stated Goals (G), Attempts (A) and Outcomes (O). Causal relations assessed included Enabling, Physical, Motivational, and Psychological relations, following Trabasso & Nickels (1992). Each Goal-Attempt-Outcome (GAO) episode was examined for the use of SG elements and causal relations. Results. Group differences emerged for both aspects of macrostructure. For causal relations, narratives of BiSLI children contained fewer Enabling and Physical relations, and differed qualitatively from those of BiTD children. For SG elements, BiSLI children referred to fewer SG elements than BiTD children in the first episode, but performed like BiTD children in the second and the third episodes.

Conclusions: Story grammar elements in specific episodes along with Enabling and Physical causal relations distinguish the narratives of children with BiSLI from those with BiTD, which stresses the importance of examining wider array of macrostructure features in narratives.

1. Introduction

The present paper examines macrostructure features of narratives produced by typically developing bilingual children (BiTD) and

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bilingual children diagnosed with Specific Language Impairment (BiSLI) in an attempt to contribute to the literature on clinical markers of SLI. Narrative macrostructure is analyzed by means of Story Grammar (SG) elements and causal relations that connect these elements into a coherent structure. In previous research analyzing narrative production, SG categories have been used as a tool to identify children with and without language impairment (Duinmeijer, de Jong, & Scheper, 2012; Heilmann, Miller, & Nockerts, 2010; Reilly, Losh, Bellugi, & Wulfeck, 2004; Schneider & Dubé, 2005); however, the utility of the story grammar model for clinical purposes has been questioned (Liles, Duffy, Merritt, & Purcell, 1995). Narrative as a tool to assess linguistic abilities of children with language impairment has been recommended because it reflects linguistic and communicative competence (Botting, 2002), including how the child makes inferences about events and expresses temporal and causal relationships between them. Recent studies have investigated narrative performance of bilingual children with SLI, pointing to similar performance across the two languages of bilinguals with and without impairment (Boerma, Leseman, Timmermeister, Wijnen, & Blom 2016; Botting, 2002; Cleave et al., 2010; Hipfner-Boucher et al., 2014; Iluz-Cohen & Walters, 2012; Paradis et al., 2013). In the present study, narrative abilities of bilingual Russian-Hebrew speaking children with BiSLI and their peers with BiTD are analyzed with a special focus on SG structure for each episode of the narrative and on causal relations among SG element between and within episodes.

1.1. Narratives in children with SLI

Narratives macrostructure features of children with SLI have been extensively investigated with somewhat contradictory findings. Some studies, analyzing both macro and microstructure in the narratives of children with SLI, have found that while productivity measures (Fey, Catts, Proctor-Williams, Tomblin, & Zhang, 2004; Schneider & Dubé, 2005) and morpho-syntax (Reilly et al., 2004) are impaired in the population with SLI, macrostructure elements are quite comparable to those of TD children (Merritt & Liles, 1989; Norbury & Bishop, 2003). Other studies have shown that children with SLI can be distinguished from their peers with TLD on story macrostructure elements as well (Bishop & Donlan, 2005; Duinmeijer et al., 2012; Soodla & Kikas, 2010). The narratives of bilingual children with SLI introduce the following challenge: on the one hand, bilinguals benefit from their first language in narrative macrostructure abilities due to cross-linguistic transfer (Hipfner-Boucher et al., 2014; Squires et al., 2014; Tsimpli, Peristeri, & Andreou, 2016). On the other hand, the gap between micro and macrostructure performance is more evident in bilinguals due to their varying levels of proficiency. Even though in interpreting the results from these studies, one should take into account their methodological differences (e.g., the complexity of narrative task, the level of detail in their analyses, inclusion criteria for SLI), it seems that not all macrostructure skills show poor performance in children with SLI. In this light, some researchers distinguish different macrostructure elements, e.g. basic story structure (goals, outcomes) versus mental states (Reilly et al., 2004). The present study focuses both on Goal-Attempt-Outcome structure at the episode level (Story Grammar categories) and the causal links between these elements both within and across episodes (Causal relations).

1.2. Story grammar categories

Most macrostructure analysis is based on Story Grammar (SG) categories (Stein & Glenn, 1979; Trabasso, van der Broek, & Suh, 1989). According to this approach, narratives begin with a Setting which provides background information on the characters and their environment. A setting is followed by one or more episodes which are temporally and causally related and are centered around a protagonist. Key elements in every story are: an Initiating Event (the problem that generates/prompts the narrative), a Goal reflecting the character's motivation to solve the problem, an Attempt to achieve the Goal, and an Outcome which may or may not be successful. The identification of 'goal-directed actions' is crucial in both comprehension and production of narrative because narrative coherence depends on encoding of actions as intentional attempts when character's goals are identified (Stein & Trabasso, 1982; Trabasso & Nickels, 1992).

Studies comparing macrostructure abilities of children with SLI and TLD children indicate that children with SLI have difficulty with text-level organization of narratives along with the use of appropriate vocabulary and grammar (Boudreau & Hedberg, 1999; Gillam & Johnston, 1992; Manhardt & Rescorla, 2002; Pearce, McCormack & James, 2003; Reilly et al., 2004). Nevertheless, both children with TLD and SLI have shown similar patterns in the use of Goal-Attempt-Outcome (GAO) structure and macrostructure complexity; this finding has been reported for monolinguals (Norbury & Bishop, 2003) and for bilinguals in both languages (Altman, Armon-Lotem, Fichman, & Walters, 2016; Tsimpli et al., 2016). The analysis of narratives of bilingual children with and without SLI is complicated by possible differences in performance in the two languages. The majority of studies agree on cross-linguistic similarities in macrostructure measures (Bohnacker, 2016 for Swedish-English bilinguals; Iluz-Cohen & Walters, 2012 for English-Hebrew bilinguals; Kunnari, Välimaa, Laukkanen-Nevala, 2016 for Finnish-Swedish bilinguals). However, it has been shown that differences exist for certain SG elements, with L2 proficiency as the sources of the differences (Kapalková, Polišenská, Marková, & Fenton, 2016). Few studies have compared the performance of TD children to that of children with SLI analyzing individual macrostructure elements at the episode level. Such was the analysis performed by Altman et al. (2016), which showed no significant group or language effects on GAO components for individual episodes in narratives of bilingual children with TD and SLI.

The findings reviewed here suggest that GAO categories are not subtle enough to distinguish the narratives of children with TD and with SLI and that analyses should be more detailed and a different description research strategy should be adopted. The present study is an attempt to move in these directions. In this light, the next section reviews studies that investigated the connections between the SG categories as part of macrostructure analyses.

1.3. Causal relations

The analysis of GAO structure of children's retold narratives remains a useful tool for the analysis of coherence, but how these macrostructure elements are interrelated within and across different episodes of a story has not been widely addressed. Trabasso et al. (1989) proposed a discourse analytic model for the study of hierarchical goal plans in narratives. According to this model, GAO components are interrelated through Enabling, Physical, Motivational, and Psychological causal relations. An Enabling relation can exist between two Attempts forming a connection between episodes. A Physical relation connects an Attempt and an Outcome of the same episodes. A Motivational relation connects a Goal and an Attempt (within episodes). A Psychological relation can connect an Internal Response (triggered by an Attempt) and a Goal (between episodes). In this manner, narrative macrostructure is viewed as an interconnected network of relations between basic SG elements rather than a sequence of these elements. The analysis of causal relations thus offers added value to the analysis of GAO sequences.

The use of causal relation develops over time: young two or three year olds simply enumerate events as a precursor to narrative production, and applying causal connections occurs late in development (Trabasso & Nickels, 1992). This competence may depend on linguistic and cognitive abilities which are difficult for children in general and more so for those with language impairment. Specifically, research shows that children with SLI perform poorly on grammatical units (see Leonard, 2014, for review) and on tasks that involve cognitive processes such as working memory and inhibition (Finneran, Francis, & Leonard, 2009; Marton & Schwartz, 2003; Marton, Campanelli, Eichorn, Scheuer, & Yoon, 2014). Developmental trends in the use of causal relations by young, typically developing children may shed light on some of the weaknesses reported for the narrative abilities of children with SLI.

The ability to apply causal network involves local and global coherence. The idea of clausal distance has been introduced as a way to measure increasing ability to make connections between temporally close (local) versus temporally distant (global) events. Berman and Slobin (1994) proposed global structure as indicating the ability to relate to onset, unfolding, and resolution of plot and local structure. Young 5-year-olds produced these plot-advancing components by sequencing events temporally, but they rarely mentioned background events (e.g speaker's comments). Older children (age 9) narrated plot-advancing elements, but did not integrate individual events into a thematic whole, while adults encoded thematic information at the global level and less so other components (e.g. detailed sequencing of events).

Trabasso and Nickels (1992) also showed that older children were able to encode events relative to the global narrative goal (i.e. to find the frog in *Frog, Where Are You?*) and to provide reasons for the Attempts in different episodes (in the form of goals), thus establishing connections between episodes. Kupersmitt, Yifat, and Blum Kulka (2014) applied the causal network approach proposed by Trabasso and Nickels (1992) to study narrative coherence in L2/Hebrew of sequential bilingual children and monolingual Hebrew-speaking children. Their study demonstrated developmental trends (ages 6–8) in the use of certain causal relations, but not for others. Specifically, Motivational and Enabling relations showed developmental and group (monolingual versus bilinguals) differences; Physical relations were stable across age and did not differ for monolinguals and bilinguals; and Psychological relations, which were scarce in both language groups, did not change across age groups. The analysis performed by Kupersmitt and colleagues is an important contribution to the limited data about the use of causal relations in young children growing up with two languages.

The present study analyses SG structure as well as causal relations in the narratives of bilingual preschool children with and without SLI in both their languages, in an attempt to extend our understanding of narrative coherence to children with atypical language development. The narrative stimuli and coding procedures used in the present study were designed to examine SG categories and causal relations within and across three episodes.

1.4. Research questions

1. To what extent do the narratives of children with BiSLI differ from those of BiTD children in terms of story grammar categories in L1 and L2? Which SG elements distinguish the two groups?
2. Which causal relations – Enabling, Physical, Motivational and Psychological – distinguish the narratives of children with BiSLI from those of BiTD children in their two languages?

1.5. Hypotheses

1. Children with BiSLI and children with BiTD are expected to show similar patterns of SG use in both of their languages. Although children with BiSLI show weaker narrative abilities than their typically developing peers, the difficulty is not expected in the realm of macrostructure accounted for by SG categories (Iluz-Cohen & Walters, 2012; Norbury & Bishop, 2003; but see Boerma et al., 2016). Cross-linguistically, bilingual children are predicted to perform similarly on measures of narrative macrostructure in both languages (Squires et al., 2014).
2. Overall, fewer instances of causal relations are expected in the narratives of children with BiSLI than in the narratives of BiTD children. Enabling relations are predicted to be more numerous in the narratives of children with BiTD, since these relations form connections between episodes, which involves global structuring (Brown. Lile, & Burns, 2011; Trabasso & Nickels, 1992). Children with BiSLI are expected to devote their more limited resources to local level information within each episode in retelling a narrative, which makes it difficult for them to alternate between local and global processing. For example, Miranda, McCabe, and Bliss (1998) relate the leap-frogging pattern of SLI children's narratives to the omission of important elements of discourse. Bishop and Donlan (2005) show that poor encoding of relevant information leads to poor recall of events in children with SLI. Physical relations are also expected to be more numerous in the narratives of BiTD children than in the narratives of children with BiSLI.

Table 1
Background information.

	BiSLI N = 14 2 female 12 males	BiTD N = 35 22 females 13 males	F(1,47)	*p*
Age (in months)	72.00 (68–78)	72.23 (67–80)	0.07	0.80
AoE(in months)	44.15 (24–60)	37.37 (0–66)	1.18	0.28
L1 Proficiency z-score (Goralnik)	−3.46 (−6.85/−1.59)	0.86 (−5.25/1.72)	38.26	< 0.001
L2 Proficiency z-score (Gagarina)	−2.81 (−5.64/−1.38)	−0.30 (-4.84/1.55)	21.91	< 0.001

BiTD children are predicted to make use of those SG elements which express full events via Physical relations (Attempts and Outcomes of the same episode), while BiSLI children are expected to encode isolated actions rather than produce a coherent story where the elements are interconnected by a Physical relation. Motivational and Psychological relations are not expected to lead to group differences, since they are assumed to be more complex and thus less frequent in narratives of preschool children (Trabasso et al., 1989). In the absence of research on cross-language differences in causal relations, we expect similar use of these relations by bilingual children.

2. Method

2.1. Participants

Participants were 35 typically developing bilinguals (BiTD) and 14 bilinguals diagnosed with Specific Language Impairment (BiSLI). Bilingual SLI was defined as a language impairment in both languages (Armon-Lotem, 2014) and entailed performance at least 1.25 standard deviations below norm on L1 and L2 proficiency tests, as described in the following section. Children assigned to the group with BiSLI also had a record of parental concern about their language development, as expressed on a parent questionnaire/interview conducted at the time informed consent was given. The parent questionnaire included details about their child's language history and current language use. The age of first exposure to L2 (AoE) in months was determined based on this report. All children were sequential Russian-Hebrew bilingual children who had been exposed to L1/Russian at home with exposure to L2/Hebrew primarily during preschool. All children attended Hebrew-speaking preschool at the time of the study. Parental consent was secured, and the study was approved by the university IRB and by the Israeli Ministry of Education. Background information (age in months, AoE, L1 and L2 proficiency scores) is presented in Table 1.

2.2. Materials

Proficiency tests. To assess proficiency in L1/Russian, the *Russian Language Proficiency Test for Multilingual Children* (Gagarina, Klassert, & Topaj, 2010) was administered. This test included measures of expressive (noun/verb naming, production of case and verb inflections) and receptive language (comprehension of grammatical constructions, nouns and verbs). L2 proficiency was diagnosed using the *Goralnik Screening Test for Hebrew* (Goralnik, 1995), which includes subtests for vocabulary, sentence repetition, comprehension, oral expression, pronunciation, and story-telling.

Narrative stimuli. To elicit narratives, two wordless picture books and scripts served as stimuli ('Baby Birds' and 'Baby Goats' stories). Each one consisted of six pictures, two for each of three episodes. The stimulus scripts begin with the Setting and an Initiating Event (IE) and are followed by three episodes. All three episodes have similar internal structure: they have an explicit Goal, a character's Attempt to achieve the Goal, and the Outcome of the Attempt. Causal relations connect story grammar categories both within and between episodes. The picture stimuli and scripts in Russian and Hebrew were taken from the *LITMUS-Multilingual Assessment Instrument for Narratives* (*MAIN*; Gagarina et al., 2012) which was developed in the framework of COST Action IS0804 "Language Impairment in a Multilingual Society: Linguistic Patterns and the Road to Assessment". The stimulus pictures and the English version of one of the scripts (Baby birds) appear in Appendix A.

Parent questionnaires. All parents completed a linguistic background questionnaire which elicited information about age, age of first exposure to the second language (AoE), history of exposure to L1 and L2, patterns of language use at home, as well as parents' concern regarding language development.

2.3. Procedure

Narratives were collected in a quiet area in the preschool in L1/Russian and L2/Hebrew using a retell procedure. MAIN's two modes of narrative elicitation are telling and retelling. The current study chose retelling because previous research has shown that children provide more story information during retelling than telling (Schneider & Dubé, 2005). Another advantage of retelling is that for coding purposes the story script can be used as a basis for assessment. Prior research also shows that in retelling mode, when the script is provided, children may be better able to free up their linguistic and cognitive resources to cope with additional aspects of narrative production, such as evaluative devices or causal relations between events. Thus, retelling aimed to maximize production among children with SLI.

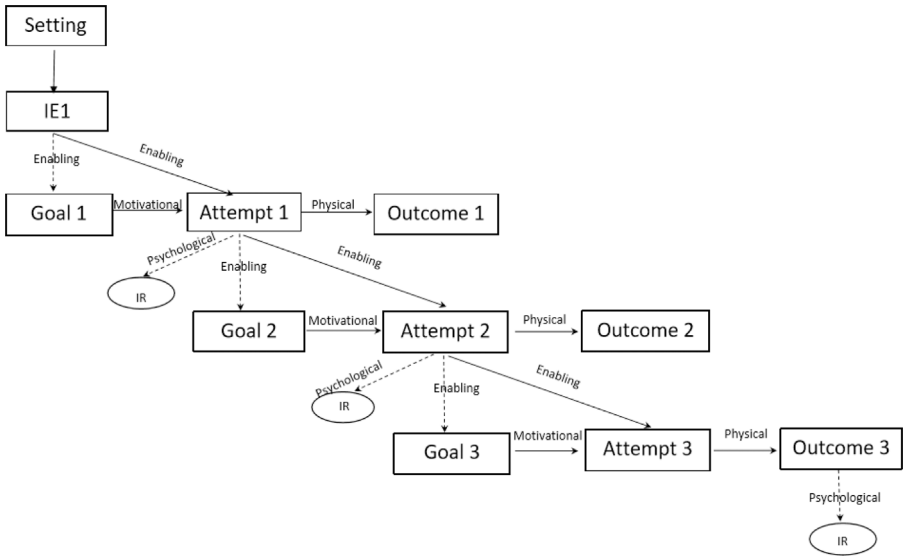


Fig. 1. Hierarchal representation of SG elements and causal relations for the stimulus scripts and picture stimuli. Adapted from Trabasso and Nickels (1992).

Story content (Baby Birds or Baby Goats) and order of presentation were counterbalanced across languages (L1/L2). The story script was first read as the child followed along in the wordless picture book. Then the experimenter introduced a puppet as a friend of the child, saying: "This is Miffi. He is very shy. He gets very shy when he hears adults speaking. But he loves children. He likes when children tell him stories. So I am going to tell you a story and ask YOU to tell this story to Miffi, okay?"

The research assistants (native speakers of Russian and Hebrew) were trained prior to data collection on how to elicit the narratives. The elicitation procedure was designed to create an atmosphere of story reading in order to get the child to retell the story in a relaxed and open manner rather than a formal repetition of a recorded script. A detailed elicitation procedure is available for the MAIN in Gagarina et al. (2012).

2.4. Transcription and coding

All narratives were transcribed by native speakers of Russian and Hebrew using CHILDES and CHAT conventions (MacWhinney, 2000).

Story grammar categories. Stories were coded for the following story grammar categories: Setting, Initiating Event (IE), three Goals (G), Attempts (A), and Outcomes (O), one for each of the three episodes, and Ending (Stein & Glenn 1979). This yielded a maximum total score of 12.

Each of the 12 categories was assigned a score of 0 or 1 to indicate the presence or absence of that category, and scores were converted to proportions out of the total number of categories. The story script and its classification into SG elements are attached in Appendix B.

Causal relations. Four types of causal relations (Enabling, Physical, Motivational, and Psychological) were coded based on Trabasso and Nickels (1992) and outlined schematically in Fig. 1.

Fig. 1 shows connections (arrowed lines) between SG elements within and across episodes. Relations that connect SG elements between episodes are represented by Enabling relations. Relations that connect SG elements within episodes are represented by Physical and Motivational relations. Psychological relations link Internal Responses to Attempts, Outcomes, or Goals, in some cases extending across episodes.

Causal relations connect two SG categories, the first serving as the antecedent and the second as a complement of a relation. As seen in Fig. 1, Goals are critical elements in Enabling, Motivational, and Psychological relations. In fact, a Goal can serve multiple functions when an Enabling, Motivational, and Psychological relation is expressed. For Enabling relations, Goals are the complement of an antecedent Attempt (or the Initiating Event), thus linking one episode with another. For Motivational relations, Goals are antecedents of Attempts within a single episode. Table 2 provides operational definitions and examples of the four types of relations from the narrative stimuli.

Coding was carried out as follows. First, narratives were divided into clauses, and each clause was assigned a SG category. Next, causal relations were assigned based on relations between the SG elements defined in Table 2. Only clauses assigned to a SG category were coded for causal relations. In several cases, when a clause was not assigned either a SG category or a causal relation because it did not contribute to overall coherence, it was marked as 'unclassifiable' (e.g. 'and the goat was eating'). Coding of linguistic expressions for SG categories and causal relations is described below in the relevant results sections.

Table 2
Definitions and examples of four types of causal relations.

Causal relation	Definition	Example
Enabling	Connects an Attempt to a Goal or to a subsequent Attempt in the following episode OR connects the story's Initiating Event to a Goal or Attempt (in the first episode).	*She (cat) climbed up the tree and grabbed one of the baby birds* (Attempt). *A brave dog that was passing by saw that the baby bird was in danger and decided to save it* (Goal).
Physical	Connects Attempts and Outcomes within episodes.	*She ran into the water* (Attempt). *The mother goat pushed the baby goat out of the water* (Outcome).
Motivational	Connects Goals and Attempts within episodes.	*She ran into the water* (Attempt) *because she wanted to save it.* (Goal)
Psychological	Establishes relations between Internal Responses and Attempts or Outcomes.	*The birds were happy* (Internal Response) *because they were safe* (Outcome).

2.5. Reliability

Coding was done by two bilingual graduate students in linguistics. Twenty percent of the transcripts (half in L1 and half in L2) were chosen arbitrarily and coded by a second researcher. Inter-rater reliability of coding was calculated using the intra-class correlation coefficients (ICC) for SG categories and causal relations. For Russian narratives the ICC score was 0.97 for SG coding and 0.90 for causal relations. For Hebrew the ICC score was 0.97 for SG categories and 0.99 for causal relations.

3. Results

3.1. Description of the corpus

Overall 98 narratives were retold in the two languages, 49 Baby Birds (BB) and 49 Baby Goats (BG). Table 3 summarizes the following descriptive features of the retold stories: mean length (clauses), mean length (words), frequency of nouns and frequency of verbs. Frequencies of nouns and verbs were calculated as a percentage of the number of words. A one-way ANOVA was performed on these measures to test for Group differences (Table 3). Language differences were not compared for length due to syntactic, morphosyntactic and lexicalization differences between Russian and Hebrew. The only significant Group difference was for mean length in words in L1, where BiTD narratives were longer than narratives of the children with BiSLI. The difference between the groups for mean length in clauses approached significance, where BiTD narratives were longer than narratives of children with BiSLI in L1.

3.2. Story grammar (SG) categories

3.2.1. Quantitative analysis

Every clause in children's narratives was coded for the presence (1) or absence (0) of SG categories and causal relations. This produced ordinal data sets which were analyzed using non-parametric statistics. The data were further transformed into ratios for parametric statistical tests. Table 4 lists the proportions of children referring to each SG element in L1 and L2 as well as the results of a non-parametric test for independent groups (Mann-Whitney) comparing narratives of children with BiSLI and BiTD for each category.

The data presented in Table 4 indicate that children with BiSLI and with BiTD show differences across the three episodes for the various SG categories. Of the 12 SG categories examined in each language, seven showed significant group differences. All but one of these differences showed greater use of SG elements in the narratives of children with BiTD, five in L1 and one in L2. The one exception was found in Episode 2, where children with BiSLI produced more Goals in L2 than children with BiTD. Wilcoxon non-parametric tests for within-subject comparisons were conducted to compare the proportions of each of the SG categories in L1 and L2 for each group. For the group of children with BiSLI, language differences favoring L2 were significant only for Goal in episode 2 (more children mentioned Goals, $Z = -2.00$, $p = 0.05$). For the BiTD group, the language difference was significant for Outcome 3 (more children mentioned Outcome in L1 than in L2, $Z = -2.32$, $p = 0.02$) and for Endings (more children produced Ending in L2, $Z = -3.00$, $p = 0.003$).

Table 3
Narrative descriptive data for children with BiSLI and BiTD in L1/Russian and L2/Hebrew.

	L1				L2			
	BiSLI 7 BB, 7 BG	BiTD 17 BB, 18 BG	ANOVA F(1,47)	*p*	BiSLI 7 BB, 7 BG	BiTD 18 BB, 17 BG	ANOVA F(1,47)	*p*
Mean length in clauses	12.14 (3.92)	15.11 (5.15)	3.77	0.06	14.50 (7.18)	14.00 (3.61)	0.11	0.75
Mean length in words	52.14 (19.04)	66.69 (19.72)	5.54	0.02	76.57 (46.39)	74.40 (18.26)	0.06	0.81
Frequency of nouns	0.27 (0.09)	0.24 (0.07)	1.95	0.17	0.21 (0.05)	0.21 (0.06)	0.01	0.92
Frequency of verbs	0.26 (0.06)	0.25 (0.05)	0.16	0.69	0.21 (0.04)	0.20 (0.03)	0.64	0.43

BB = Baby Birds, BG = Baby Goats.

Table 4
Proportion of children referring to SG categories.

	L1				L2			
	BiSLI	BiTD	*U*	*p*	BiSLI	BiTD	*U*	*p*
Setting	0.07	0.46	150.50	0.01	0.21	0.31	220.50	0.49
IE	0.64	0.97	164.50	0.002	0.86	0.91	231.00	0.56
Goal1	0.21	0.46	185.50	0.20	0.29	0.49	196.00	0.21
Attempt1	0.57	0.69	217.00	0.45	0.29	0.69	147.00**	0.01
Outcome1	0.21	0.69	129.50	0.003	0.43	0.63	196.00	0.21
Goal2	0.57	0.57	245.00	1.00	0.86	0.51	161.00*	0.03
Attempt2	0.93	0.69	185.00	0.08	0.79	0.71	227.50	0.61
Outcome2	0.50	0.69	99.50	0.23	0.79	0.71	227.50	0.61
Goal3	0.36	0.23	213.50	0.36	0.14	0.17	238.00	0.81
Attempt3	0.79	0.97	199.50	0.03	0.86	0.94	224.00	0.33
Outcome3	0.43	0.80	154.00	0.01	0.57	0.54	238.00	0.86
Ending	0.43	0.31	217.00	0.45	0.36	0.66	171.50	0.06

To assess overall production of macrostructure, a total SG score was calculated (maximum = 12) and submitted to a 2 (Group) X 2 (Language) ANOVA. The analysis yielded a significant main effect for Group, $F(1,47) = 8.75$, $p = 0.005$, $\eta^2 = 0.16$, but no significant main effect for Language, $F(1,47) = 0.35$, $p = 0.56$. The interaction of Group and Language was also not significant, $F(1,47) = 1.33$, $p = 0.25$. For the significant Group effect, BiTD children produced more SG elements than children with BiSLI. Means were 6.07 ($SD = 1.77$) and 7.40 ($SD = 1.26$) for the BiSLI and BiTD groups, respectively. In a further effort to clarify the use of story grammar elements across episodes, GAO (Goal, Attempt, Outcome) sequences were compared for individual episodes. For each episode the maximum score was 3; the proportion of SG elements produced in each episode appears as GAO proportion in Table 5.

A 2(Group) x 2(Language) x 3(Episode) ANOVA performed on GAO proportion yielded: a trend toward a significant main effect for Group, $F(1,47) = 3.60$, $p = 0.06$, $\eta^2 = 0.07$; a significant main effect for Episode, $F(2,46) = 17.89$, $p < 0.001$, $\eta^2 = 0.28$, and a significant Group by Episode interaction, $F(2,46) = 11.63$, $p < 0.001$, $\eta^2 = 0.20$. The main effect for Language was not significant $F(2,46) = 0.07$, $p = 0.94$.

In order to clarify the significant Group by Episode interaction, one-way ANOVAs for repeated measures were conducted separately for BiSLI and BiTD groups in L1 and L2 with Episode (GAO1/GAO2/GAO3) as the independent variable and GAO proportion as the dependent variable. Results showed that the difference between the episodes was significant for the BiSLI group in both L1, $F(2,12) = 4.77$, $p = 0.03$, $\eta^2 = 0.44$ and L2 $F(2,12) = 24.00$, $p < 0.001$, $\eta^2 = 0.80$. Post-hoc Bonferroni analyses showed that in L1 children with BiSLI had fewer GAO sequences in Episode 1 than in Episode 2 ($p = 0.02$); the difference was not significant for the comparison of Episodes 1 and 3 ($p = 0.21$) or for Episode 2 vs. 3 ($p = 0.25$). In L2, children with BiSLI produced significantly fewer GAO sequences in Episode 1 than in Episode 2 ($p < 0.001$) and significantly fewer in Episode 3 than Episode 2 ($p = 0.008$). The comparison of Episodes 1 and 3 was not significant ($p = 0.12$). Finally, the Episode effect was not significant for the BiTD group in either L1, $F(2,33) = 0.50$, $p = 0.61$, or L2, $F(2,33) = 1.09$, $p = 0.34$. The interaction of Group and Episode is illustrated in Fig. 2.

In summary, children with BiTD produced more SG elements than children with BiSLI. In L1, BiTD children produced longer narratives (in words) and referred to more SG elements (Setting, IE, Outcome 1, Attempts 3, Outcome 3) than children with BiSLI did, as seen in Table 4. The analysis of GAO structure (Table 5) showed that the BiTD children outperformed the children with BiSLI in the first and the third episodes, and the individual SG analysis showed that children with BiSLI performed better than BiTD children in Episode 2. These findings show that global organization may be at the heart of the difficulty children with BiSLI show in focusing on SG elements in the central episode (episode 2) and not at the beginning (episode 1) or the end of the narrative (episode 3). As a result, episode-level coherence is maintained (at least in episode 2), but global-level coherence is compromised. Although the two groups produced GAO structures similarly across the two languages, when individual data on the use of SG elements was examined for the two groups, the differences between children with BiSLI and with BiTD appear sharper in L1 than in L2. This cross-language difference can be attributed to more marked weakness of children with BiSLI in L1 in their effort to use their limited resources to acquire the L2.

Table 5
Means and standard deviations of GAO proportion.

	L1		L2		Total	
	BiSLI	BiTD	BiSLI	BiTD	BiSLI	BiTD
GAO1	0.33 (0.35)	0.61 (0.32)	0.33 (0.35)	0.60 (0.31)	0.33 (0.26)	0.60 (0.23)
GAO2	0.67 (0.23)	0.65 (0.30)	0.81 (0.28)	0.65 (0.30)	0.74 (0.19)	0.65 (0.21)
GAO3	0.52 (0.25)	0.67 (0.18)	0.52 (0.28)	0.55 (0.16)	0.52 (0.19)	0.61 (0.13)
Total	0.51 (0.19)	0.64 (0.20)	0.56 (0.26)	0.60 (0.15)	0.53 (0.16)	0.62 (0.14)

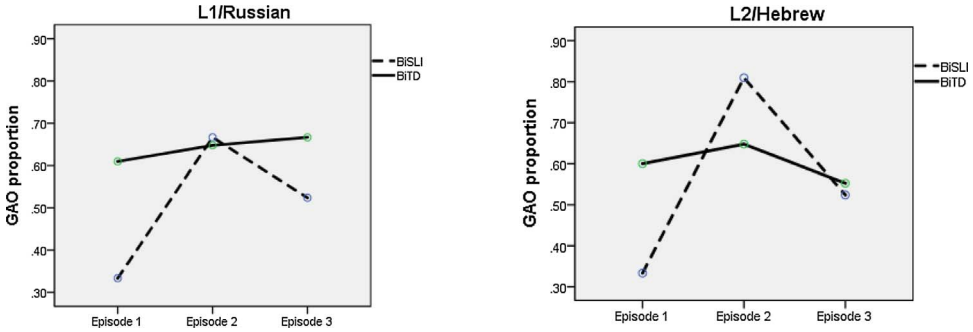


Fig. 2. GAO proportions across the three episodes of the narratives of children with BiSLI and BiTD for L1/Russian (left panel) and L2/Hebrew (right panel).

3.2.2. Qualitative analysis

The findings regarding group differences are reflected in the narrative examples below. The BiTD and BiSLI narratives are presented in their entirety, each line in the transcript corresponding to a single clause. All the SG elements are indicated and glosses are provided.

A narrative from a BiTD child in L2 (example 1) contains most of the elements of the first (Goal, Attempt, and Outcome), second (Goal, Attempt, and Outcome), and the third (Attempt, Outcome) episodes. The narrative begins with the IE ('the birds were hungry'). Then the next character (mother) is introduced in a clause that contains Attempt 1 ('mother went away') and Goal 1 ('to look for food'). Following the canonical story structure scheme (Stein & Glenn, 1979), the IE triggered a response from the protagonist. This is followed by the introduction of the second episode's main protagonist ('the mean cat saw that mother left the nest'), followed by the full GAO sequence: Goal 2 ('wanted to eat the baby bird'), Attempt 2 ('climbed the tree'), and Outcome 2 ('caught the baby bird'). The following clause introduces the main character of the third episode ('the dog, who was passing by'), followed by the dog's Attempt 3 ('grabbed the cat'). The Goal category of the third episode is missing, but the child seems to motivate the dog's Attempt 3 by repeating the cat's Outcome 2 ('meanwhile the cat grabbed the baby goat'). This outcome also serves as the dog's motive, as expressed in a repeated Attempt 3 ('the brave dog pulled him by the tail'). In summary, the BiTD child narrative introduced all the main characters in order of appearance; it included the full set of SG elements (except for Goal 2), and used appropriate linguistic tools (complex syntactic structures and cohesive devices, such as anaphoric references).

(1) 01aga, BiTD, L2

IE	*yom exad ha- ciporim hayu re'evim* one day DEF birds^{FEM} were hungry$^{MASC.PL}$
Attempt 1&Goal 1	*ve- ima halxa lexapes oxel* and mother went^{FEM} search^{INF} food *ve- ha- xatul ha- ra ra'a* and DEF cat^{MASC} DEF bad^{MASC} saw^{MASC} *she- ha- cipor azva et ha- qen* that DEF bird^{FEM} left^{FEM} ACC DEF nest
Goal 2	*hu raca litrof gozal exad* he wanted^{MASC} devour^{INF} baby-bird^{MASC} one^{MASC}
Outcome 1	*ad she- ha- cipor xazra ehm hevi'a tola'at* till that DEF bird^{FEM} returned^{FEM} brought^{FEM} worm
Attempt 2	*ha- xatul tipes al ha- ec* DEF cat^{MASC} climbed^{MASC} on DEF tree
Goal 2	*ve- raca litrof gozal* and wanted^{MASC} devour^{INF} baby-bird^{MASC} one^{MASC} *ha- kelev she- avar ba- sviva* DEF dog^{MASC} that passed^{MASC} in neighborhood *hu tafas ba- xa(tul)* he caught^{MASC} by cat
Outcome 2	*bentayim xatul tafas bentayim et ha- gozal* meanwhile cat^{MASC} caught^{MASC} meanwhile ACC DEF baby-bird
Attempt 3	*ve- ha- kelev ha- amic mashax oto ba- zanav* and DEF dog^{MASC} DEF brave^{MASC} pulled^{MASC} him by tail
Outcome 3	*ve- az hu ha- xatul barax* and then he DEF cat^{MASC} ran-away^{MASC}
Ending	*ve- kelev radaf axarav* and dog^{MASC} chased^{MASC} after-him

The main group differences were related to the number of SG elements produced and the difficulty of children with BiSLI in

producing the first and the third episodes. The weak microstructure skills of children with BiSLI led to shorter, less complex clauses and may have contributed to incomplete retelling. Example 2, a narrative in L2 from a child with BiSLI, illustrates some of the quantitative group differences highlighted above. The child's narrative begins with the central goal of the story (Goal 2), the wolf's desire to catch a baby goat.

(2) 06lio, BiSLI, Baby Goats, L2

Goal 2	*ha- ze'ev eh raca.* DEF wolf^{MASC} wanted^{MASC}
IE	*ha- gdi haya be- saqana lihiyot levad ba- mayim.* DEF baby-goat^{MASC} was^{MASC} in danger be^{INF} alone in water *ve- shu'al ra'a eh haya ze…* and fox^{MASC} saw^{MASC} was^{MASC} this *eh hu haya ba- sade* he was^{MASC} in field
Goal 2	*raca litrof oto ve- le'exol* wanted^{MASC} devour^{INF} him and eat^{INF}
Attempt 2	*ve- shu'al qafac* and fox^{MASC} jumped^{MASC}
IR	*ve- hu yifxad* and he was-scared^{MASC} (wrong verb pattern) *ve- ha- cipor eh ra'a et ze* and DEF bird^{FEM} saw^{MASC} ACC this
Outcome 2	*shu'al tafas* fox^{MASC} grabbed^{MASC} *ve- hu ra'a* and he saw^{MASC}
Attempt 3	*ha- cipor taraf et ha- zanav* DEF bird dovoured^{MASC} ACC DEF tail
Ending	*ve- ha- cipor af* and DEF bird^{FEM} flew^{MASC}

Syntactically the transitive verb 'want' requires a direct object, which was omitted by the child. Only after Goal 2 ('the wolf wanted' [to catch the baby goat]) does the child initiate the narrative: 'the baby goat was in danger to be alone in the water', the clause was marked as IE. The child then repeats the fox's Goal with improved lexis and syntax ('wanted to devour him and eat'). By omitting all SG elements from the first episode, the child neglects the circumstances explaining why the baby goat was left alone. These omitted SG elements purportedly facilitate the fox's Goal 2 and Attempt 2. Most of the child's linguistic resources are invested in describing the central events of the story which appear in episode 2: Goal 2 is followed by Attempt 2 ('and the fox jumped'), and Outcome 2 ('the fox caught'). Although in these two clauses the child omits the adjunct ('jumped' [towards the baby goat]) and the argument ('caught' [the baby goat]), these omissions did not interfere with macrostructure categories. The third episode is retold only partially, and this observation is consistent with the quantitative finding that children with BiSLI produced significantly fewer GAO sequences in Episode 3 than in episode 2 (in L2): the narrative includes Attempt 3 ('the bird devoured the tail') but both the Goal of the bird and the Outcome of the Attempt are not provided.

3.3. Causal relations

As discussed above, the frequency of SG elements alone seems to be insufficient to explain the inconsistent results of previous studies regarding the performance of children with and without impairment on measures of macrostructure (e.g. Altman et al., 2016; Boerma et al., 2016). In an effort to clarify this issue and to better understand the nature of narrative coherence, we examined causal relations between the basic SG elements in the narratives of children with BiSLI and with BiTD.

Causal relations reflect the connections between basic SG categories or between SG categories and characters' internal responses. Four basic relations, as outline in Table 2, were investigated: Enabling, Physical, Motivational, and Psychological. As with SG categories, these data were first analyzed using non-parametric statistics, then converted to proportions for parametric analysis.

This part of the paper is organized as follows: the first section focuses on quantitative analysis of group data, examining the proportion of children who produced Enabling, Physical and Motivational relations for each of the three episodes and then presenting results of a MANOVA for Group and Language. Psychological relations are treated separately at the end of this section. Excerpts from BiSLI and BiTD narratives are presented to illustrate these findings. The following section presents individual analyses of each of the four types of relations, again including excerpts from the narratives.

3.3.1. Quantitative analysis

Table 6 displays the proportion of children (with BiSLI and with BiTD) who produced Enabling, Physical, and Motivational

Table 6
Proportions of children producing Enabling, Physical, and Motivational relations.

	Episode	L1				L2			
		BiSLI	BiTD	*U*	*p*	BiSLI	BiTD	*U*	*p*
Enabling	1	0.14	0.80	84.00	< 0.001	0.36	0.71	157.50	0.02
	2	0.43	0.66	189.00	0.15	0.36	0.69	164.50	0.04
	3	0.64	0.77	213.50	0.36	0.50	0.54	234.50	0.79
Physical	1	0.21	0.49	178.50	0.08	0.14	0.43	175.00	0.06
	2	0.50	0.51	241.50	0.93	0.64	0.46	220.50	0.53
	3	0.43	0.80	154.00	0.01	0.50	0.54	241.50	0.93
Motivational	1	0.21	0.37	206.50	0.29	0.21	0.46	185.50	0.12
	2	0.50	0.43	227.50	0.65	0.71	0.49	189.00	0.15
	3	0.29	0.26	238.00	0.84	0.07	0.20	213.50	0.28

relations in L1 and L2 and the results of a series of Mann-Whitney tests comparing the two groups for each episode. Group differences emerged for Enabling relations in both L1 and L2 for episode 1 and in L2 for episode 2. For Physical relations, a Group difference emerged in L1 for episode 3, with more causal relations for children with BiTD than for children with BiSLI. Cross-linguistic differences were treated with Wilcoxon Signed-Ranks tests for each group separately. Significant differences emerged between L1 and L2 for Enabling and Physical relations, both in episode 3: the BiTD group used Enabling and Physical relations more in L1 than in L2, $Z = -2.00$, $p = 0.05$ and $Z = -2.36$, $p = 0.02$ for Enabling and Physical relations, respectively.

Proportions of Enabling, Physical, and Motivational relations were calculated by summing the scores in the three episodes and dividing the sum by 3. Means and standard deviations are displayed graphically in Fig. 3. The proportions were submitted to a 2 × 2 MANOVA for Group and Language with Enabling, Physical, and Motivational relations as dependent variables. The analysis yielded a significant main effect for Group, $F(3,45) = 5.57$, $p = 0.002$, $\eta^2 = 0.27$. The Language effect was not significant $F(3,45) = 0.41$, $p = 0.75$, nor was the interaction of Group by Language $F(3,45) = 1.03$, $p = 0.39$. Further univariate analyses showed that the Group effect was significant for both Enabling relations, $F(1,47) = 16.92$, $p < 0.001$, $\eta^2 = 0.27$ and for Physical relations $F(1,47) = 4.18$, $p = 0.05$, $\eta^2 = 0.08$. BiTD children produced more Enabling and Physical relations in comparison to the children with BiSLI. The Group effect was not significant for Motivational $F(1,47) = 2.45$, $p = 0.12$ relations.

Psychological relations were analyzed as a separate category, since they are not linked to a particular episode; rather, they relate to characters and cut across episodes. The psychological relations in the stimulus narratives were defined as reactions to Attempts or Outcomes related to each of the three main protagonists: baby birds (or baby goats), cat (or fox) and dog (or bird). Children referred primarily to three types of psychological relations: (1) the Internal Response of the baby birds (or baby goats), which was mentioned mostly at the end of their narratives and (2) the Internal Responses of the cat (or fox) and (3) dog (or bird), both usually expressed by means of direct speech.

Table 7 presents the proportion of children who produced each of the three types of Psychological relations and the total sum of the three relations. Sums were converted to proportions in L1 and L2 by dividing by three (number of characters). The proportions were then submitted to a 2 × 2 ANOVA for Group by Language. Main effects were not significant, either for Group $F(1,47) = 0.66$,

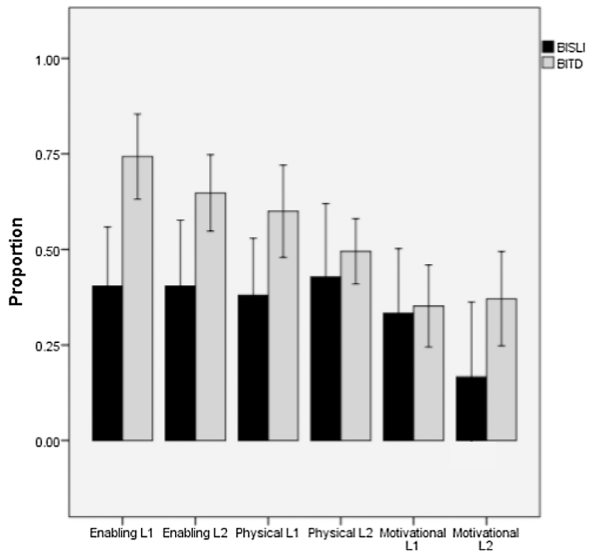


Fig. 3. Mean proportion of Enabling, Physical, and Motivational relations for narratives of children with BiSLI and BiTD in L1 and L2.

Table 7
Proportion of children referring to Psychological relations.[a]

	L1			L2		
	BiSLI	BiTD	*U*	BiSLI	BiTD	*U*
IR Baby Birds/Goats	0.21	0.50	175.50	0.50	0.31	199.50
IR Cat/Dog	0.07	0.23	206.50	0.07	0.17	220.50
IR Dog/Bird	0.14	0.20	231.00	0.21	0.17	234.50
Total	0.43	0.79	170.50	0.91	0.66	228.00

[a] Totals reflect the proportion of children in each group who produced Psychological relations related to the three characters.

$p = 0.42$ or for Language $F(1,47) = 0.14$, $p = 0.71$. A significant Group by Language interaction emerged, $F(1,47) = 5.23$, $p = 0.03$, $\eta^2 = 0.10$. And, a post-hoc Bonferroni analysis of the interaction yielded a trend toward a significant Language difference for the BiTD group (L1/$M = 0.30$, $SD = 0.28$, L2/$M = 0.15$, $SD = 0.19$; $p = 0.08$) but not for the group with BiSLI (L1/$M = 0.12$, $SD = 0.21$, L2/$M = 0.24$, $SD = 0.24$; $p = 0.12$). For this interaction, BiTD children used more Psychological relations in L1 than in L2.

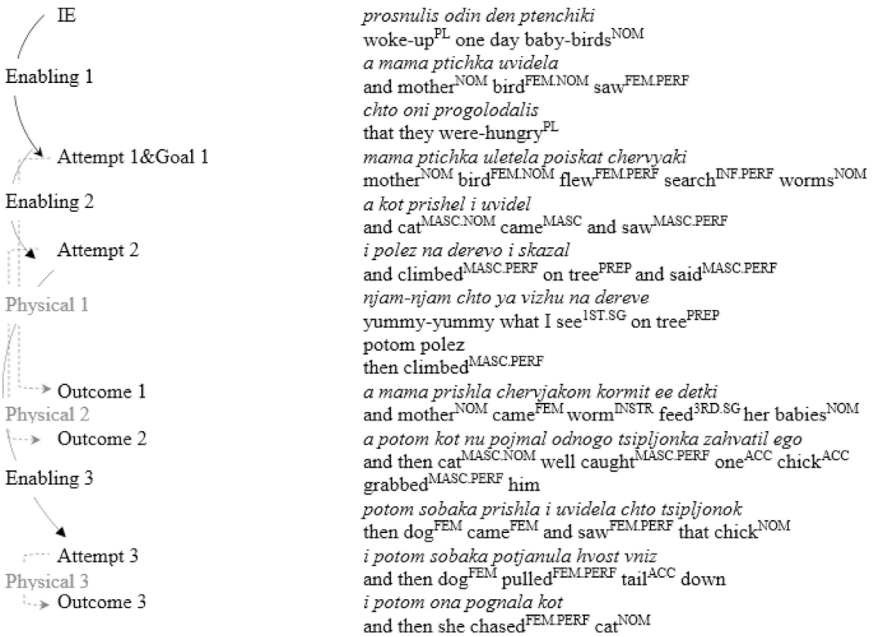
To account for different levels of proficiency, correlation analyses between the total proficiency scores and the proportions of causal relations were performed on L1 and L2 data for the two groups separately. The analyses did not reveal significant correlations for the group of children with BiSLI for either Enabling or Physical relations. Significant correlations did emerge in the narratives of the BiTD group between the L1 proficiency score and the proportion of Enabling relations, $r = 0.45$, $p = 0.006$, and the proportion of Psychological relation, $r = 0.43$, $p = 0.01$. None of the correlations were significant in L2.

In summary, BiTD children produced more Enabling and Physical relations in comparison to the children with BiSLI. For Enabling relations, children with SLI produced fewer relations for all episodes than children with TD, and these Group differences were significant in L1 for episode 1 and in L2 for episodes 1 and 2. Unlike causal relations which connect elements within episodes, Enabling relations connect events across episodes. Children with BiSLI produced more relations which were coded as 'Enabling 3′ to indicate a connection between episodes 2 and 3. This relation connects central elements of the story. For Physical relations, children with SLI produced fewer connections within episodes 1 and 3, the difference being significant in L1 for episode 3. Thus, Enabling and Physical relations confirm the pattern observed for SG Categories (Section 3.2.1), where children with BiSLI performed poorly on the first and the third episodes, but gave a fuller picture of SG elements in the second episode. Significant cross-linguistic differences emerged between L1 and L2 for Enabling and Physical relations in Episode 3: BiTD children referred to Enabling and Physical relation in L1 more than in L2.

3.3.2. Qualitative analysis

The narratives in examples (3) and (4) depict the assignment of major SG categories and of two types of causal relations in the narratives produced by participants with BiTD and with BiSLI, respectively. The narratives are presented in their entirety. Only Enabling (black arc arrows) and Physical (grey square arrows) relations are indicated.

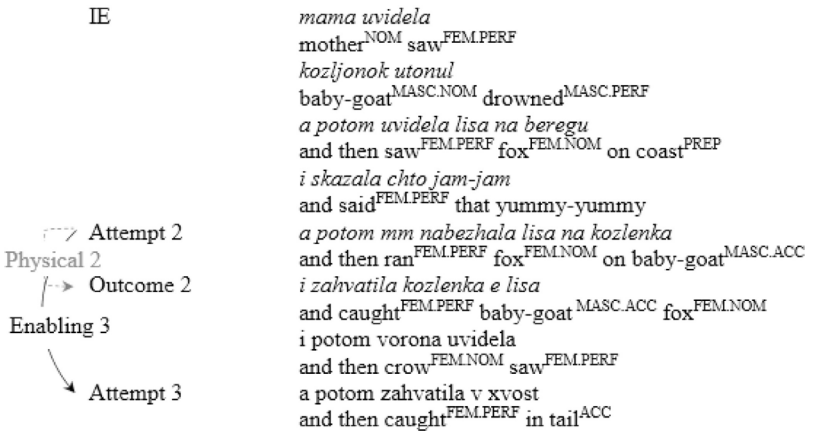
(3) 156nic, BiTD, Baby Birds, L1



In the BiTD narrative (3), the first three clauses describe the IE ('one day baby birds woke up and mother bird saw that they were hungry') followed by Attempt 1 ('mother bird flew away to look for worms'), showing the connection expressed by an Enabling relation (Enabling 1). Next, the child introduces the main character of the second episode ('a cat came and saw') and although a complex syntactic structure is expected, such as 'saw that mother flew away', the connection between the episodes is established nonetheless with Attempt 1 and Attempt 2 ('the cat climbed'). In Outcome 1 ('mother came and fed her babies with a worm') although the child made a microstructure error in the second clause of the Outcome ('babies' is in nominative case instead of genitive), it did not interfere with category assignment, and a Physical relation connects Attempt 1 and Outcome 1 (Physical 1). Following the order of events as it appears in the transcript, the child produces Outcome 2 ('the cat caught one chick'), thus receiving credit for the second Physical relation (Physical 2). The third episode is initiated when the dog is introduced ('then a dog came'), followed by a clause which connects the second and the third episodes ('and saw that the chick'). This last utterance encodes an unfinished clause (probably due to word retrieval difficulty), but the connection is established. The following Attempt 3 ('the dog pulled the tail down') is connected to Attempt 2 by means of an Enabling relation (Enabling 3). The final clause of the narrative is marked as Outcome 3 and is connected to Attempt 3 by Physical relation (Physical 3). Overall the coherence of the narrative stems from the three Enabling and Physical relations based on Attempts and Outcomes, despite the fact that only a single Goal was produced.

By way of comparison, the narrative in example (4) shows Enabling (black arc arrows) and Physical (grey square arrows) relations in L1 for a child with BiSLI. The child begins retelling the story with the IE, but the first episode's GAO structure is entirely omitted. Consequently, neither Enabling nor Physical relations appeared for the first episode. Immediately following the IE, the child introduces the second episode's main character ('and then a fox saw on the coast'), where omission of the verb's complement did not affect the expression of SG elements.

(4) 502ale, BiSLI, Baby Goats, L1



This clause is expected to link episodes 1 and 2 and facilitate establishment of an Enabling relation. However, due to the omission of the first episode's SG elements, the relation was not realized. The next two clauses correspond to Attempt 2 ('the fox ran to the baby goat') and Outcome 2 ('and the fox caught the baby goat') which together form a Physical relation (Physical 2), despite the morphological error in the main verb. Introduction of the character in the third episode ('then a crow saw') serves as a linguistic means to connect episodes 2 and 3, and Attempt 2 is causally related to Attempt 3 by means of an Enabling relation (Enabling 3). A Physical relation could not be established in the third episode due to the omission of Outcome 3. To summarize, the only causal relations produced in this BiSLI narrative were Enabling 2 and Physical 2. As a result, the only parts of the narrative which are perceived as coherent is the central portion and, to some extent, the final portion, where causal relations were identified.

In summary, the qualitative analyses contrasting BiTD and BiSLI's narratives show more SG elements and more causal relations (Enabling and Physical) for the BiTD narrative, and illustrate the tendency of children with BiSLI to focus on the central part of the story.

3.4. Individual analysis of causal relations

In order to explore whether the individual data reflect the group patterns report above (i.e. more Enabling and Physical relations in the narratives of children with BiTD than with BiSLI), narratives of each participant were examined for the frequencies for each type of relation. Tables 8–11 display the number and percent of children with BiSLI and BiTD who produced Enabling, Physical, Motivational and Psychological relations, respectively. The quantitative data are followed by narrative excerpts.

Enabling relations. Table 8 presents the frequencies and percentages of children who produced from 0 to 3 Enabling relations. The most salient finding is the contrast between BiTD and BiSLI narratives for production of the full set of three Enabling relations. Almost half (43%) of the BiTD participants produced all three relations (54% did so in L1), while only one child with BiSLI produced all three Enabling relations. At the other end of the scale, 21% of children with BiSLI did not produce any Enabling relations in their narratives, while only 6% of BiTD children failed to produce a single Enabling relation.

The following narrative (5), retold in L2, illustrates a BiSLI narrative missing all three Enabling relations.

Table 8
Frequency and percentage of participants who produced Enabling relations.

Enabling relations	L1				L2				Totals			
	BiSLI		BiTD		BiSLI		BiTD		BiSLI		BiTD	
3	0	0%	19	54%	1	7%	11	31%	1	4%	30	43%
2	6	43%	9	26%	5	36%	12	34%	11	39%	21	30%
1	5	36%	4	11%	5	29%	11	31%	9	32%	15	21%
0	3	21%	3	9%	3	29%	1	3%	6	21%	4	6%

Table 9
Frequency and percentage of participants who produced Physical relations.

Physical relations	L1				L2				Total			
	BiSLI		BiTD		BiSLI		BiTD		BiSLI		BiTD	
3	0	0	10	29%	2	14%	3	9%	2	7%	13	19%
2	5	36%	12	34%	3	21%	14	40%	8	29%	26	37%
1	6	43%	8	23%	6	43%	15	43%	12	43%	23	33%
0	3	21%	5	14%	3	21%	3	9%	6	21%	8	11%

Table 10
Frequency and percentage of participants who produced Motivational relations.

Motivational relations	L1				L2				Total			
	BiSLI		BiTD		BiSLI		BiTD		BiSLI		BiTD	
3	0	0	4	11%	1	7%	2	6%	1	4%	6	9%
2	5	36%	6	17%	2	14%	11	31%	7	25%	17	24%
1	4	29%	14	40%	7	50%	12	34%	11	39%	26	37%
0	5	36%	11	31%	4	29%	10	29%	9	32%	21	30%

Table 11
Frequency and percentage of participants who produced Psychological relations.

Psychological relations	L1				L2				Total			
	BiSLI		BiTD		BiSLI		BiTD		BiSLI		BiTD	
3	2	14%	2	6%	1	7%	3	9%	3	11%	5	7%
2	1	7%	7	20%	3	21%	8	23%	4	14%	15	21%
1	4	29%	12	34%	4	29%	12	34%	8	29%	24	34%
0	9	64%	14	40%	6	43%	12	34%	15	54%	26	37%

(5) 14iva, BiSLI, Baby Goats, L2

Setting	*yom exad ima shel ha- shel ha- tinoq* day one mother POSS DEF baby
Attempt 2	*ha- shu'al ose tofes le- tinoq ha- za(nav)* DEF fox^{MASC} make^{MASC} grab^{MASC} to baby DEF tail *ha- shu'al ose tofes oto* DEF fox^{MASC} make^{MASC} grab^{MASC} him
IR	*hu baxa* he cried^{MASC}
Attempt 3	*varona@cs tafas la- shu'al* crow^{FEM} grabbed^{MASC} to fox
IR	*ha- shu'al baxa* DEF fox^{MASC} cried^{MASC} ve- zehu. and that's-it

The child begins the narrative with the Setting but omits the IE and all the elements of the first episode; as a result, Enabling 1 is not produced. Enabling 2, which is designed to connect Attempt 1 with either Goal 2 or Attempt 2 is missing due to the omission of Attempt 1. Enabling 3 should link Attempt 2 and Goal 3 (or Attempt 3). The child produces Attempt 2 ('the fox catches the baby's tail') and an incomplete rendering of Attempt 3 ('crow caught the fox's). The Enabling relation is not realized between these categories, since the child omitted a linguistic expression which would have connected the two episodes (e.g. 'the bird saw that a baby goat was in danger.') and therefore would have resulted in an Enabling relation. In this excerpt the two attempts are produced as two unrelated actions. Thus, resulting narrative names characters and describes events but lacks coherence due primarily to the omission of connections across episodes.

Physical relations. Table 9 presents the frequencies and percentages of children who produced 0–3 Physical relations. Children with BiTD and BiSLI showed similar patterns. In both groups, 70% of the children produced either one or two Physical relations.

Proportionally more children with BiTD produced the full set of three Physical relations (19% vs. 7% for BiSLI), and more children with BiSLI had no Physical relations (21% vs. 11% for BiTD).

The following narrative (6) is an example of the omission of Physical relations by a child with BiSLI in L2. The first clause is identified as IE ('he fell into the water'), where the new character (baby goat) is introduced using a personal pronoun 'he' with no preceding referent. All SG elements of the first episode are omitted. In the second episode Goal 2 ('a wolf wants to eat him') is marked, where the complement of the verb 'eat' is either in the wrong case (dative instead of accusative) or in an unfinished clause. The child confused the order of events, first producing the Attempt 3 ('a bird bit his tail') with an ambiguous pronominal reference ('him') and a morphological error, and only then Attempt 2 ('and then a wolf xxx the donkey's leg'). The main verb of Attempt 2 is glossed as unidentified (xxx), because the verb *strogav* does not exist in this form in Russian, but its meaning can be guessed from the context as related to some form of attack or biting. Neither Outcome 2 nor Outcome 3 are stated, resulting in zero Physical relations for the narrative.

(6) 401emi, BiSLI, Baby Goats, L1

IE	*on upal v vodu.* he fell$^{\text{MASC.PERF}}$ in water$^{\text{ACC}}$
Goal 2	*i volk hochet skushat' emu.* and wolf$^{\text{MASC.NOM}}$ want$^{\text{3RD.SG}}$ eat$^{\text{INF.PERF}}$ him$^{\text{DAT}}$
Attempt	*i potom ptitsa pokusila emy xvost.* and then bird$^{\text{FEM.NOM}}$ bit$^{\text{FEM.PERF}}$ him tail$^{\text{ACC}}$
Attempt 2	*i potom volk strogav emu nogu oslika.* and then wolf$^{\text{MASC.NOM}}$ xxx him$^{\text{DAT}}$ leg$^{\text{ACC}}$ donkey$^{\text{GEN}}$
	i konec. and end$^{\text{NOM}}$
	on emu druzej. he him$^{\text{DAT}}$ friends$^{\text{GEN}}$
	konec. end$^{\text{NOM}}$

Motivational relations. Individual data for Motivational relations are presented in Table 10. The percentages show similar distributions for children with BiTD and BiSLI, with most children (67 and 72% respectively) producing one or no Motivational relations. These frequencies are consistent with the results of group analyses where no significant differences emerged between the two groups for the use of Motivational relations.

Excerpt (7) from a BiTD child's L1 narrative illustrates the use of both a motivated Attempt and an unmotivated Attempt.

(7) 407mar, BiTD, Baby Goats, L1

IE	*odin raz odin kozljonok utonul* one time one$^{\text{MASC.NOM}}$ baby-goat$^{\text{MASC.NOM}}$ drowned$^{\text{MASC.PERF}}$
Motivational 1	*mama ego uvidela* mother$^{\text{NOM}}$ him$^{\text{GEN}}$ saw$^{\text{FEM.PERF}}$
Attempt 1& Goal 1	*i mama pobezhala ego spasti chto ego vytashit* and mother$^{\text{NOM}}$ ran$^{\text{FEM.PERF}}$ him$^{\text{ACC}}$ save$^{\text{INF.PERF}}$ that him$^{\text{ACC}}$ pull-out$^{\text{INF.PERF}}$
Outcome 1	*ona ego vytaskivala i vytashila* she him$^{\text{ACC}}$ pulled-out$^{\text{FEM.IMPERF}}$ and pulled-out$^{\text{FEM.PERF}}$
	ne zametila NEG noticed$^{\text{FEM.PERF}}$
	chto lisa byla pod derevom that fox$^{\text{FEM}}$ was$^{\text{FEM}}$ under tree$^{\text{INSTR}}$
Attempt 2	*i potom ona prygnula na kozljonka* and then she jumped$^{\text{FEM.PERF}}$ on baby-goat$^{\text{MASC.ACC}}$

The IE ('one day a baby goat drowned') begins the narrative. Attempt 1 ('mother ran') is motivated by Goal 1 ('to save him and pull him out'), both expressed in a single clause. The following Outcome 1 ('she was pulling him and she pulled') completes the GAO structure of episode 1. In contrast, Attempt 2 ('and then she jumped on baby goat') is not motivated due to the omission of Goal 2. This narrative is consistent with the individual data where the majority of narratives in both groups included only one Motivation relation.

Psychological relations. Psychological relations were identified when a child expressed a protagonist's Internal Response to an Attempt or Outcome. The original script triggered three main Psychological relations. The first two were encoded in the direct speech of the cat (fox) ('yummy, yummy, what do I see on the tree?') and the dog (bird) ('what are you looking for?'), both coded as Internal Responses to Attempts (or Outcomes) that lead to Goals (or Attempts) in the following episode. The third Psychological relation involved the Internal Response of the baby birds (baby goats) at the end of the story expressing relief for having been saved ('the

birds/goats were happy because they were safe'). As seen in Table 11, Psychological relations were very infrequent. 83% of the children with BiSLI and 71% of the children with BiTD produced one or none. The two Psychological relations which included direct speech are complex relations because they connect an Attempt (1 or 2) to a Goal (2 or 3): the child is expected to express the relation between an Internal Response using direct speech and a complex SG category (Goal). That complexity is illustrated in Excerpt (8) from a BiTD narrative.

In this excerpt, an Internal Response (IR) is expressed by direct speech (DS) ('what are you looking for there?'), which itself was triggered by Outcome 2 ('and then she [cat] took one baby bird'). That relation is linked to Attempt 3 ('she [dog] bit her by the tail') to form a Psychological relation.

(8) 23ali, BiTD, Baby Birds, L1

	Outcome 2	*i potom ona zabrala odnogo ptenchika* and then she took$^{FEM.PERF}$ one$^{MASC.ACC}$ baby-bird$^{MASC.ACC}$
		i potom sobaka uvidela i sprosila and then dog^{FEM} saw$^{FEM.PERF}$ and asked$^{FEM.PERF}$
Psychological	IR (DS)	*chto ty tam ishesh'* what you there look-for$^{2ND.SG}$
	Attempt 3	*i potom ona ejo ukusila* and then she her^{ACC} bit$^{FEM.PERF}$
		i za xvost potjanula vniz and by tail^{ACC} pulled$^{FEM.PERF}$ down
	Outcome 3	*i koshka ubezhala* and cat^{FEM} ran-away$^{FEM.PERF}$

In summary, the individual data and narrative excerpts show support for the group differences reported in the quantitative section of the paper. Moreover, these qualitative data contrast narratives with and without causal relations, showing differences in coherence and indicate the unique role of each type of causal relation.

4. Discussion

The aim of this study was to examine two related aspects of narrative macrostructure – Story Grammar categories and Causal relations – in an attempt to distinguish the narratives of bilingual preschool children with BiSLI and BiTD in both their languages. The findings showed both group and individual differences for SG elements and Causal relations as well as between the three episodes of the narratives. Somewhat more modest differences resulted across the two languages.

For SG categories, more children with BiTD produced more SG elements than children with BiSLI, where the narratives in L1 showed sharper differences between the two groups (see Table 4). In terms of causal relations, Enabling and Physical relations distinguished the narratives of children with BiTD and BiSLI. BiTD children produced significantly more Enabling and Physical relations. These differences were more salient in L1 than in L2 (see Table 6). Motivational and Psychological relations did not distinguish the narratives of the two groups. The individual data supported these group differences. More children from the BiTD group produced all three Enabling and Physical relations, and more children with BiSLI produced no Enabling or Physical relations at all in their narratives.

The following sections discuss these group differences in an attempt to identify markers of SLI in the macrostructure features examined in this study. L1-L2 differences are discussed in terms of their interaction with group differences and differences between episodes.

4.1. Story grammar categories

Based on literature for macrostructure abilities of bilingual children, we predicted no significant group differences between the narratives of children with BiTD and BiSLI for production of SG categories. The findings showed, however, that overall SG scores (across both languages and all three episodes) demonstrated group differences, with BiTD participants outperforming BiSLI participants, thus rejecting the hypothesis that SG elements would not distinguish the narratives of the two groups. In general, these findings support those of Boerma and her colleagues (Boerma et al., 2016) who also made use of the LITMUS-MAIN materials and procedure (Gagarina et al., 2012). In Boerma et al. (2016), retelling showed a clear disadvantage for monolingual and bilingual children with language impairment on macrostructure measures of comprehension and production. The present study introduced a detailed breakdown of SG categories and GAO sequences for each of the three episodes of the narratives in both L1 and L2.

Taking into account Language (L1/L2) and focusing on the episode level, the Group difference in favor of the BiTD children appeared mainly in L1 and in episodes 1 and 3. In the second episode, BiSLI narratives had more Goals and Attempts than the BiTD group. Thus, L1 was better able to distinguish the two groups for story grammar categories.

The analysis at the episode level indicates that children with BiTD outperformed children with BiSLI in the first and the third episodes, but children with BiSLI produced relatively more SG elements than BiTD children in episode 2. In terms of cross-language

comparisons, children with BiSLI produced fewer elements of the first episode in both languages, but differed significantly from the BiTD group in L1 for Settings, Initiating Events and Outcomes, and in L2 for Attempts (Table 4).

These results are consistent with processing accounts of SLI which have suggested that these children process information slowly and have short-term memory limitations (Leonard, Weismer, Miller, Francis, Tomblin, & Kail, 2007; Miller, Kail, Leonard, & Tomblin, 2001). Narrative retelling, especially in a multi-episode narrative, involves complex operations which require both macrostructure and microstructure abilities. Processing this information to produce a coherent and grammatical narrative takes children with SLI more time. And omission of information in the first episode is one indication that it takes them more time to get warmed up. Nevertheless, children with BISLI did relate to the emotional center of the story, which comes in episode 2 ('the cat grabbed the baby bird…/the fox grabbed the baby goat…'), compensating to some extent for the omission of crucial elements in episode 1. It is not the case that children with SLI cannot process and produce crucial SG elements (e.g. goals). Rather, the multiple-episodic structure is linguistically and cognitively demanding. In episode 3, children with BISLI produced fewer Attempts and Outcomes than children with BiTD (although the difference was significant only in L1). This reduced performance in the third episode is insightful from a perspective of memory limitations. If recency effect is expected in retelling, as many SG elements should have been recalled in the third episode as in the second episode. The lack of recency effect might indicate that the emotional center of the story is more salient for the children thus overshadowing the recency effect. Furthermore, the fact that children with language impairment gave a full account of the second episode suggests that they do not show weakness in episode-level story grammar, but rather show a break down beyond a single episode. That is, they focus on local coherence and fail to provide global structure.

Research has acknowledged that children with SLI have more limited resources to cope with the complexity of the narrative task which involves global-level cognitive (e.g. attention) skills and local-level linguistic skills (e.g. syntactic knowledge) (Bishop & Donlan, 2005). The current results provide insight into how bilingual children with SLI produce narratives: rather than giving details on different levels (beginning, middle, and end), they tell the core elements (which may be more emotionally salient). We see then that narrative production of children with BiSLI can be characterized by slow processing time and focus on local rather than global level of coherence.

The observed performance of children with BiSLI across episodes and languages shed light on the lack of consensus regarding the performance of children with language impairment on narrative macrostructure. While most studies of monolingual children agree that children with SLI have reduced abilities to produce narrative macrostructure (Bishop & Donlan, 2005; Botting, 2002; Colozzo, Gillam, Wood, Schnell, & Johnston, 2011; Fey et al., 2004; Heilmann et al., 2010; Merritt & Liles, 1989; Miranda et al., 1998; Norbury, Gemmell, & Paul, 2014; Reilly et al., 2004, Soodla & Kikas, 2010; Squires et al., 2014), studies comparing bilinguals with and without SLI do not show the same consensus. Boerma et al. (2016) and Squires et al. (2014) reported differences between bilingual children with SLI and their peers with TD for macrostructure, but Tsimpli et al. (2016), Altman et al. (2016), and Iluz-Cohen and Walters (2012) show similarities between children with SLI and children with TD. These discrepancies cannot be attributed to methodological differences in data collection and coding procedures, since most of these studies used the same procedures. Rather, the reason for inconsistent results may be related to cross-linguistic differences in microstructure in which case, the dominant language with better microstructure might bootstrap macrostructure abilities. Further evidence on L1–L2 differences or similarities should help clarify this lack of consensus by addressing the question whether bilingualism exacerbates or enhances macrostructure narrative abilities for L1 and L2 or just for the dominant language. One way to resolve this point is to collect narratives from both languages of bilinguals and to focus on cross-language comparisons. The results of the current study further demonstrate the importance of episode-level analysis of narrative production in children with SLI.

4.2. Causal relations

The most clear-cut findings of this study were the group differences for causal relations. Causal relations in the narratives of children with BiSLI differed both quantitatively and qualitatively from those of children with BiTD. These differences were significant for Enabling and Physical relations, but not for Motivational and Psychological relations. Each of the relations will be discussed in turn, with special attention to variation across episodes.

Enabling relations, connections *between* episodes, were more frequent in the narratives of children with BiTD, and more children from the BiTD group produced all three Enabling relations. In addition, more children with BiSLI produced no Enabling relations at all in their narratives. Although on the whole, children with BiSLI produced fewer relations than children with BiTD (Fig. 3), at the episode level, their Enabling relations connecting episodes 2 and 3 were comparable to those of children with BiTD (Table 6). As noted in the trend observed for SG categories, children with BiSLI produced more relations connecting the central events of the story.

This finding too can be explained by BiSLI children's processing limitations and restricted abilities in dealing with global coherence. Due to slow processing and/or restricted attentional resources (Finneran et al., 2009; Miller et al., 2001), producing a narrative with several episodes connected by multiple events is challenging for children with SLI. Enabling relations which connect elements across episodes require a refined level of global coherence, since they reflect an ability to make inferences about events (Graesser, Singer, & Trabasso, 1994). Furthermore, narrative is a platform where the interaction of global structure and linguistic performance occur in parallel. As has been previously acknowledged, it is difficulty in simultaneous processing in complex tasks that characterizes the performance of children with SLI (Marton & Schwartz, 2003).

Children with BiSLI bring to the narrative task limited processing abilities and limited exposure to each of their two languages (Kohnert, 2010). They may, however, have some enhanced (non-linguistic) cognitive skills by virtue of their bilingualism (Bialystok, 2009). Yet these cognitive abilities seem not to compensate for limitations due to the linguistically multifaceted nature of the narrative retelling task. One way to examine the role of processing limitations on narrative performance (not investigated in the

present study) is to compare bilingual and monolingual children with SLI on both cognitively relevant tasks and linguistic tasks. Comparisons of this nature are inherently difficult, since they do not usually take into account the two languages of the bilingual participants. Moreover, research shows conflicting evidence. Kohnert, Windsor, and Pham (2009) report similar cognitive processing weaknesses (e.g. working memory, speed of processing and attention) in bilingual and monolingual children with SLI. Paradis (2007) suggested that reduced exposure to each of the bilingual's two languages may result in even poorer performance for children with SLI in each of their languages, but ruled out this proposal because bilingual children with SLI acquire linguistic structures at a rate similar taso monolingual children with impairment. In other words, further delay due to limited exposure of bilingual children with SLI compared to monolingual children with SLI was not registered.

Processing difficulties and limited exposure impact on coherence in narrative production. Enabling relations are crucial for coherence from the outset of the story, since they connect the IE with the Attempt of the first episode, thus creating a context for the entire narrative. Children with BiSLI apparently had difficulty reconstructing this context in introducing the storyline. Enabling relations are also important for global coherence. Research has reported deficits in working memory for both monolingual (Marton & Schwartz, 2003; Weismer, Evans, & Hesketh, 1999) and bilingual children with SLI (Girbau & Schwartz, 2008) and a weakness in simultaneous processing. Maron and Schwartz (2003) registered the difficulty of children with SLI to encode the final elements in the non-word recall task (the absence of recency effect). Narrative retelling in general, and the production of Enabling relations in particular, require recall of details and organization of information into a coherent whole. The narratives of children with BiSLI tended to focus on the middle of the story (episode 2). Thus, they did not produce the initial Enabling relation connecting the IE with the Attempt in episode 1 and did not make the between-episode connections between Attempts in the episodes 1 and 2, usually omitting Attempts. Thus, even though they were able to create a strong mental representation for the most salient event at the center of the story (episode 2), children with BiSLI were not able to create a narrative with global coherence.

Physical relations, connections between Attempts and Outcomes *within* episodes, were more frequent in the narratives of children with BiTD than in the narratives of children with BiSLI and were omitted more often by children with BiSLI. The two groups produced Attempts and Outcomes at similar rates, but differed for full episodes (Attempts and Outcomes) for episodes 1 and 3. The flow of the events of a story is reflected in the use of Physical relations, and Physical relations are particularly important in the first episode to get the story moving. The narratives of BISLI children were missing SG elements in episode 1, which resulted in failure to produce Physical relations.

Since Physical relations are expressed linguistically by verbs, one plausible explanation for BiSLI children's difficulty in producing Physical relations might be limitations in microstructure knowledge (e.g. lexis, syntax). However, since these same children produced as many Physical relations in the second episode as children with BiTD in L1 and even more Physical relations than children with BiTD in the second episode in L2 (albeit not statistically significant), this explanation should be discounted. It appears that it is not microstructure which impedes children with BISLI's ability to produce Physical relations in episode 1 since low frequency verbs (e.g., *climb* and *grab*) appeared more often in episode 2 than higher frequency verbs (e.g., *fly*, *come back*, *fall, save*) in episode 1. This fine-grained analysis shows the importance of assessing macrostructure as an independent construct, since it may reflect different processes.

Motivational relations are considered difficult for preschool children, emerging only gradually around age 5 and becoming comparable to those of adults as late as age 9 (Trabasso & Nickels, 1992). The finding that very few Motivational relations were produced in the narratives of both groups is consistent with this work.

Both Motivational and Enabling relations involve goals; for the former they are obligatory and for the latter they are optional. Our findings showed that overall children encoded few Goals and thus omitted Motivational relations, but the majority of children were able to convey global coherence by means of mental state terms as linguistic expressions of Enabling relations. This suggests that Enabling relations may appear in preschool children's narratives as a substitute for Motivational relations, aiding in coherence but not expressing motivations per se.

Motivational relations did not yield significant Group or Language differences in the proportion of children who produced them or in the total number of Motivational relations, but did show some differences in the way each group distributed Motivational relations across the episodes of the narratives. For the narratives of the children with BiSLI, over half of their Motivational relations were concentrated in the second episode, whereas for the narratives of the children with BiTD most Motivational relations (approximately 80%) were clustered in the first two episodes of their narratives. The finding for the children with BiSLI was consistent with their use of Enabling and Physical relations as well as their use of SG categories. Their narratives focused on the second episode which is the central most salient part of the story thus making the most of their limited linguistic resources.

Psychological relations take narrative to a different level of analysis, adding an evaluative dimension (of characters' intentions). In the present study, Psychological relations were defined as links between Internal Responses and Goals and between an Outcome and an Internal Response (based on Trabasso & Nickels, 1992). Physical relations add a dimension of complexity, since they are both local (within episodes) and global (across episodes). Thus, they appeared infrequently in the narratives of both groups: half of the BiSLI narratives and a third of the BiTD narratives did not contain any Psychological relations. When Psychological relations were produced, they most often dealt with the baby birds'/goats' overall feelings of fear and their resulting sense of safety by connecting the Outcome with the baby birds'/goats' IR (feeling of safety) at the end of the story. Of those children who did produce one or more Psychological relations, this particular relation comprised half the total of Psychological relations, indicating that these children had a notion of global coherence. This global relation functioned as a conclusion to the story.

The other two Psychological relations in the story scripts were encoded as connections between an Internal Response (expressed as direct speech, e.g. 'Yummy, yummy, what do I see on the tree?') and a goal. Internal Responses and goals involve an understanding of the characters' intentions. It is this understanding which helps generate a Psychological relation. Approximately 25% of children in

each group expressed relations between an IR expressed via direct speech and a Goal.

Psychological relations were more frequent (albeit not significantly) in the narratives of BiTD children (in L1). This is strong evidence for superior macrostructure abilities among BiTD children, since Psychological relations are both more complex (involving Goals and IRs) and more global (connecting the beginning of the story with the end).

4.3. L1-L2 differences

No significant differences emerged overall between L1 and L2 narratives either for the production of SG categories or causal relations. However, group differences were more pronounced in L1 due to the high proportion of BiTD children who included SG elements in their narratives. For causal relations, episode 3 revealed the clearest L1-L2 differences for both Enabling and Physical relations with an advantage for L1 in BiTD narratives. In this way, L1 was better able to distinguish the two groups for story grammar categories and causal relations. A correlation analysis performed between language proficiency scores in each language and the proportion of causal relations aimed to account for this group difference. Significant correlations emerged only in L1 for Enabling and Psychological relations and only for the BiTD group.

This finding points to the varying levels of L1 proficiency in bilingual children with TD which may affect narrative performance for the entire BiTD group. Although some studies have reported that the two languages of bilinguals do not differ with respect to macrostructure (e.g. Boerma et al., 2016), the current results suggest that a certain level of proficiency is needed in order to produce causal relations successfully in both languages. We would argue that it is the stronger L1 proficiency among BiTD children which impacts the greater use of basic SG elements and causal relations in the present study.

The fact that the effect of proficiency in L1 emerged for Enabling relations but not for Physical relations can be explained by greater linguistic and cognitive demands involved in the production of Enabling relations which require linking events from different episodes and accessing appropriate linguistic expressions to convey that link. Physical relations were less demanding, requiring mostly verb knowledge. Thus, the combination of more difficult Enabling relations coupled with proficiency in L1 assisted us in uncovering differences between the narratives of children with BiTD and BiSLI. The clauses produced by children with BiSLI were often syntactically impoverished, that is, it was enough to produce the main verb (e.g. *grabbed*) and omit the argument (*grabbed **the tail***) in order to express a Physical relation.

The result of the current analysis suggests that in order to better understand the interaction between impairment and bilingualism in young children's narratives, research should examine the data from both languages of bilinguals, and the narrative analysis should be carried out at the episode level as well as for global organization.

5. Conclusions

The present paper documented features that distinguished the narratives of children with BiSLI from those with BiTD, primarily in terms of causal relations and to somewhat lesser extent in terms of story grammar elements. BiSLI narratives usually contain the core story grammar elements − Goals, Attempts and Outcomes, but they produce them inconsistently and frequently omit relations between and within episodes. In particular, they fail to produce the story's Initiating Event, which interferes with overall coherence even if they do manage to produce the final Outcome of the story. BiSLI narratives were characterized by a solid middle with essential, yet at times minimal, SG elements and relations. This suggests a strong mental representation for the most salient event at the center of the story.

Given limitations in both cognitive resources and linguistic microstructure, children with BiSLI may rely on a single strategy for accomplishing what BiTD children can do with multiple strategies (which include more frequent and more diverse SG elements as well as intra- and inter-episode connections). Among the features which showed evidence for a single strategy approach among BiSLI children were: a. lack of variety of SG elements in Enabling relations (they used mostly Attempts), b. limited distribution of GAO sequences across the three episodes (they focused primarily on the second episode), and c. limited production of causal relations.

Future research on narrative coherence among bilingual children with language impairment should explore particular aspects of the linguistic expression of causal relations (e.g. goals, mental state terms, clausal distance) and how they influence macrostructure. Methodologically, comparison of story generation (telling) and retelling and familiar and unfamiliar stories would yield insight into how the child manipulates story grammar and causal relations under different task conditions. In order to tease out potential differences between the two languages, the impact of typological differences in microstructure on the production of causal relations should be addressed.

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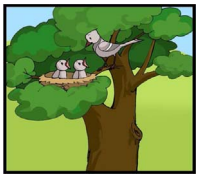
Appendix A

Picture stimuli and script

The Cat and the Birds

Picture 1



One day there was a mother bird who saw that her baby birds were hungry.
Picture 2

She flew away because she wanted to find food for them.
A mean cat saw that the mother-bird was flying away and wanted to catch a baby bird.
Picture 3

Meanwhile, the mother bird came back with a worm for the baby birds and did not see the cat. The mean cat meowed “Yummy Yummy, what do I see on the tree?
Picture 4

She climbed up the tree and grabbed one of the baby birds.
A brave dog that was passing by saw that the baby bird was in danger and decided to save it.
Picture 5

The dog said to the cat: What are you looking for?
And then he grabbed the cat’s tail and pulled her down.
Picture 6

The cat that the dog pulled fell down and the dog chased her away.
The birds were happy because they were safe.

Appendix B

Baby Birds narrative script with SG categories.

One day there was a mother bird	Setting
who saw that her baby birds were hungry.	Initiating event
Episode 1	
She flew away	Attempt 1
because she wanted to find food for them.	Goal 1
Meanwhile, the mother bird came back with a worm for the baby birds and did not see the cat.	Outcome 1
Episode 2	
A mean cat wanted to catch a baby bird.	Goal 2
She climbed up the tree	Attempt 2
and grabbed one of the baby birds.	Outcome 2
Episode 3	
A brave dog decided to save it.	Goal 3
And then he grabbed the cat's tail and pulled her down.	Attempt 3
The cat that the dog pulled fell down	Outcome 3
and the dog chased her away. The birds were happy because they were safe.	Ending

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