Narrative production in monolingual and bilingual children with Specific Language Impairment

Short title: Narratives in Specific Language Impairment

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ABSTRACT

The aim of this study was to identify potential clinical markers of Specific Language Impairment (SLI) in bilingual children with SLI by using the Greek version of the Multilingual Assessment Instrument for Narratives for SLI from COST Action IS0804. Twenty-one Greek-speaking monolingual and fifteen bilingual children with SLI, along with two groups of monolingual and bilingual children with typical development (TD) were tested. Results showed differences between TD children and children with SLI in microstructure, while bilingual children with SLI were found to attain similar levels of performance, and even outperformed monolingual children with SLI in macrostructure. It is suggested that a retelling coding scheme could permit differential diagnosis of SLI among bilingual children within the scope of narrative assessment.

Specific Language Impairment (SLI) is characterized by persistent low performance on language measures in comparison to typically-developing (TD) peers, in the absence of intellectual disorders, severe hearing loss, sensory deficits, frank neurological disorders or other developmental problems (Leonard, 1998; Rice et al., 2005). Although SLI has been understood to be a disorder that predominantly affects morpho-syntax and/or lexical semantics (Leonard & Deevy, 2006; Kail, 1994; Miller et al., 2001), literature has shown that children with SLI also have deficits in other domains of language, such as pragmatics. For instance, Katsos and colleagues (2011) have recently found that children with SLI were challenged by complex quantifiers in a linguistic-pragmatic task, while other studies found the production of under-informative or over-informative referring expressions to be higher in children with SLI than in their age-matched TD peers (Johnston et al., 1997; Peristeri & Tsimpli, 2013).

While language deficits in children with SLI have been frequently related to mild impairments in the computational syntactic system itself (van der Lely, 1994, 1998, 2002; Gopnik & Crago, 1991), few studies have also observed an association between the language deficit and executive functions, such as working memory. The finding that linguistic processing in children with SLI is affected by working memory constraints suggests that some types of computations in the specific population are better seen as processes used to efficiently balance task demands, rather than competence deficits (Kail, 1994; Miller et al., 2001; Ellis Weismer et al., 1999). For instance, use of under-informative referential expressions (i.e. use of null subject pronouns instead of full nominal expressions while re-introducing characters) in Peristeri and Tsimpli's (2013) story-telling study has been found to positively correlate with SLI children's low scores in a verbal working memory interference-based task. Recently, the shift in theories from a discrete grammatical deficit model to a deficit characterized by domain-general cognitive abnormalities in SLI has redirected attention to the investigation of the children's language use within the pragmatic context in which it occurs (Duinmeijer et al., 2012; Newman & McGregor, 2006; Norbury & Bishop, 2003; Lam-de Waal, 2012; Reilly et al., 2004).

The increasing number of children with atypical language development growing up in simultaneous or sequential bilingual contexts has added to the perplexity of issues related to our understanding of where language difficulties in SLI come from. The bulk of research so far has examined the impact of dual language input on TD bilingual children. Current studies compare claims regarding the influence of bilingualism on domain-specific language areas and domain-general cognitive systems. The main findings suggest costs in verbal performance on measures such as vocabulary (Bialystok & Feng, 2011; Bialystok et al., 2010; Marchman et al., 2010; Vagh et al., 2009), lexical access (Yan & Nikolaidis, 2009; Windsor & Kohnert, 2004) and grammaticality judgments (Conboy & Thal, 2006; Marchman et al., 2004; Parra et al., 2011). The same studies show that bilingual children exhibit better performance than monolingual children in tasks impinging high degrees of selective attention and conflict resolution (Bialystok, 1999; Carlson & Meltzoff, 2008; Bialystok & Viswanathan, 2009; Yang et al., 2011). These results have been mainly discussed in terms of a model of cognitive and linguistic processing in which bilingual competence enhances the domain-general executive control system to deal with language conflict without any benefits on the rate of language development in TD bilingual children. On the other hand, the absence of commonly accepted clinical markers (i.e. domain-specific linguistic patterns of performance and/or domain-general cognitive components) which may differentiate between bilingualism and SLI effects in bilingual children has highlighted the need for more research on this aspect of the language disorder (e.g. Multilingual Assessment Instrument for Narratives/MAIN; Gagarina et al., 2012). One of the first accounts set to pinpoint the locus of difficulty in bilingual children with SLI has been the double-delay hypothesis (Orgassa & Weerman, 2008; Steenge, 2006). According to this account, performance in this group of children may be characterized by poorer perception and production of morpho-syntax relative to monolingual peers with SLI due to the accumulation of limited processing efficiency and exposure to dual language input in the bilingual group. The double-delay hypothesis posits that setting the value of core syntactic parameters may be constrained either because the language input is not sufficient to allow successful encoding of linguistic patterns, or because dual input requires verbal control skills that are limited in bilingual children with SLI due to their language impairment.

Paradis and colleagues (Paradis et al., 2005/2006; Paradis et al., 2003; see also Paradis, 2010 for a general overview) refuted the double-delay hypothesis by demonstrating that French-English bilingual children with SLI exhibited similar accuracy levels with their monolingual peers with SLI in an object clitic production task that was conducted in both languages. A small number of subsequent studies also showed that performance of bilingual children with SLI did not differ significantly from monolingual children with SLI on a range of morpho-syntactic markers indicating that a re-evaluation of theories arguing for lower performance in SLI populations due to bilingualism was necessary. More specifically, Armon-Lotem (2012) tested bilingual English-Hebrew children with a diagnosis of SLI and Hebrew-speaking monolingual children with SLI on inflectional morphology and prepositions; between-group comparisons yielded no differences, thus, suggesting no double-delay effects for the bilingual language-impaired children.

Still, potential markers of SLI in bilingual children are not clearly identified; moreover, the extent to which atypical language development may be affected by developmental cognitive changes driven by bilingualism remains unexplored too. Studies that have attempted to disentangle genuine language impairment from effects of bilingualism in the children’s linguistic behaviour have mostly focused on core linguistic aspects of morpho-syntactic production rather than on more global features of language performance instantiated in connected speech and/or narrative comprehension and production. In this respect, studies evaluating the double-delay hypothesis on the grammatical development of bilingual children with SLI did not also consider more global aspects of language ability which may differentially be affected by SLI and bilingualism. In the current study, we tested the hypothesis that SLI and bilingualism effects would map onto distinct levels of language use with language impairment affecting more features like morpho-syntax, while bilingualism affecting properties of macrostructure in narrative production, like use of internal state terms, story grammar and story comprehension.

Recent studies on language comprehension in conditions of language interference have revealed a bilingual advantage. Specifically, bilingual children are shown to be better skilled at controlling language interference (Filippi et al.,, 2014), as well as at recruiting top-down mechanisms to efficiently integrate information pieces during comprehension (Ambrose & Molina, 2014). Moreover, bilingual children's domain-specific experience with cross-linguistic competition has been shown to transcend to domain-general executive functions, suggesting that bilingual children may be particularly adept at inhibiting irrelevant information (Soveri et al., 2011; Carlson, & Meltzoff, 2008) and at selectively focusing attention on the properties of both languages (e.g., Bruck & Genesee, 1995; Chen et al., 2004) or the weaker language (Davidson & Raschke, 2009) to avoid making errors. Under the assumption of the specific cognitive control advantages in bilingualism and the bi-directional relation between cognition and language, we hypothesized that bilingualism would have a positive impact on children's performance in narrative discourse. We thus expected that bilingual children would be better able than monolinguals to take a global perspective on the story and to derive the core aspects of the story's unfolding abstracting away from morpho-syntactic features or lexical content. In (re-) narrating a story, children have to build a coherent sequence of events which are causally linked with each other. Coherence is primarily driven by the selective encoding of the theme of the story, the formation of a temporal frame to locate events on the time line, and the pragmatically appropriate encoding of the story's events and characters to manage reference. Putting together the findings on the cognitive advantages conferred by bilingualism with the use of narratives as a highly sensitive tool for assessing children's local (morphosyntactic) and global (contextual and discourse) skills opens up the possibility that bilingual children with SLI would outperform age-matched monolingual children with SLI on macrostructure measures. Accordingly, narratives allow us to concentrate on different levels of linguistic analysis some of which may reflect a bilingual advantage even in children with language impairment.

NARRATIVE DEVELOPMENT IN TYPICALLY DEVELOPING CHILDREN

Narrative production has been viewed as an effective technique to tap into grammatical aspects of children's language performance, as well as into extra-linguistic processes which draw more broadly on children's cognitive skills, world knowledge and social cognition. The ability to tell stories requires an understanding of linguistic, cognitive, and social domains (Tager-Flusberg & Sullivan, 1994). An effective narrator not only has to structure the story's events in an intelligible and unambiguous way taking into consideration the listener's needs for understanding the setting, characters and outcomes of the story (Rumpf et al., 2012), but is also required to consider the perspectives of the story characters in order to explain their motivations and reactions (Stein & Glenn, 1979). There is evidence suggesting that even preschoolers contextualize their narratives based upon the needs and identity of their listeners (Creel & Bregman, 2011; McLennan & Luce, 2005; O'Neill, 1996).

Children's elicited narratives have been evaluated using two levels which represent two distinct areas of discourse: microstructure and macrostructure (Liles et al., 1995). The microstructure of a narrative can be defined as the lexical and syntactic levels and has been used to evaluate the productivity and complexity of children's language by calculating form and content linguistic devices both sententially and inter-sententially (Hughes et al., 1997). Linguistic form has been commonly assessed by analyzing children's grammatical and syntactic abilities using mean length of utterance in words (e.g. Miller, 1981), number of communication units (CUs) (i.e. one main clause with all dependent clauses; Hunt, 1965), and various measures of sentence complexity including grammatical forms (e.g. verbal tense/aspect/voice inflectional morphology), lexical forms (e.g. lexical aspect and manner of motion/cause verbs), and lexico-grammatical features (e.g. locative particles, prepositional phrases, connectives; Nippold et al., 2005; Schuele & Tolbert, 2001; Scott & Stokes, 1995). Measures of linguistic content, on the other hand, typically calculate children's lexical diversity using type-token ratios (Templin, 1957), or number of different content and function words (Miller & Klee, 1995).

The development of the microstructure of TD children's narratives is relatively protracted and is not complete even by age ten (e.g. Blankenstijn & Scheper, 2003). More specifically, previous studies on narrative discourse have shown that the narratives of young TD children show reduced length and variation in content words in comparison to older children (Botting, 2002; Justice et al., 2006). Around the age of four, children begin to increase their lexical diversity (Elbers & Van Loon-Vervoorn, 2000), and complex propositions (Berman & Slobin, 1994; Justice et al., 2006; Kaderavek & Sulzby, 2000; Reilly et al., 2004). The development of character reference tracking is also gradual and protracted (Karmiloff-Smith, 1985; Wigglesworth, 1997).

On the other hand, the macrostructure of a narrative refers to its global hierarchical organization and coherence that transcends the level of the individual utterance. Macrostructure is characterized by the scaffolding of episodes in the story-plot, event sequencing and the internal states of protagonists motivating or reacting to the events in the story (e.g. Liles et al., 1995; McCabe & Peterson, 1984; McCabe & Rollins, 1994). The majority of macrostructural measures of children's narratives share the same underlying principles of the story grammar/episodic structure description model (Fiestas & Peña, 2004; Schneider et al., 2006; Price et al., 2006; Soodla & Kikas, 2010). The story grammar model proposes that all stories have a setting and episode system; the setting provides background information and introductory statements about the characters and the providing context, while the episode system includes three main components that occur in all stories: (a) an initiating event (i.e. an external event that motivates main characters to act), (b) internal plans (i.e. intended actions to achieve a goal and solve the problem), and (c) consequences/outcomes (i.e. success or failure in achieving a goal). A complete episode must include all three of these key components (McCabe & Peterson, 1984). Studies have found a developmental increase in the number of important story components included in oral narratives with the ability to express a character's reactions or internal responses being fully acquired around the age of ten (Bishop & Donlan, 2005; van den Broek, 1997).

Theory of Mind (ToM) abilities have also been argued to underlie efficient production of characters' reactions (Lorusso et al., 2007; Tomasello, 2003). Children may express their understanding of characters' thoughts and feelings through the use of internal (or mental) state terms. Internal state terms can be divided into general categories, such as emotional terms (*happy, sad, feel*) and cognitive ones (*think, remember, realize, wonder, know*) (Westby, 2005). So far, there is evidence showing a strong relationship between children's mastery of the syntax of sentential complementation and their understanding of the mind of others (de Villiers, 2005, 2007). In fact, knowledge of how to use morpho-syntactic structures and adapt them to contextual cues, including other individuals' perspectives, continues to develop into adolescence (Reilly et al., 2004). Research suggests that the patterns of acquisition for mental state terms are different depending on the internal properties of the terms in question; Baldimtsi, Peristeri and Tsimpli (2014) found a developmental progression in the type of mental state language 7-12 year-old TD children use in their narratives showing that volitional and emotional terms precede cognitive ones.

NARRATIVES IN CHILDREN WITH SLI

Over the past two decades, a considerable volume of experimental work has accumulated on the topic of narrative production in monolingual children with SLI, and their control over micro- and macrostructural properties in particular. Difficulties have been identified at both levels. Specifically, monolingual children with SLI have been found to differ from their TD peers in using fewer morpho-syntactically complex sentences, connectives and pronominal referential expressions, making more grammatical errors and exhibiting reduced lexical diversity during narrations (Fey et al., 2004; Gillam & Johnston, 1992; MacLachlan & Chapman, 1988; Newman & McGregor, 2006; Norbury & Bishop, 2003; Miranda et al., 1998). Some studies have also reported differences from age-matched TD children in narrative length, more specifically, in number of utterances or words (Newman & McGregor, 2006; Fey et al., 2004; Botting, 2002).

Interestingly, the oral narratives of children with SLI have been shown to be comparable with those of younger language-matched TD children indicating delay rather than atypical development (Eadie et al., 1997). To our knowledge, Moldinov's study (in Armon-Lotem, 2010) is the only one that reports on the narrative performance of a group of nine 6-year-old Russian-Hebrew bilingual children with SLI along with two age-matched groups of TD bilingual and monolingual Russian-speaking children with a diagnosis of SLI. Both SLI groups in the specific study have been shown to achieve significantly lower levels of performance relative to the TD bilingual group on all the language measures tested.

Regarding macrostructure in the oral narratives of monolingual children with SLI, research has led to rather contradictory conclusions. Some studies have shown that SLI children's narrative output contains fewer complete story grammar components and fewer complete episodes relative to age-matched TD peers (Reilly et al., 2004; Roth & Spekman, 1986). For example, Olley (1989) has found that children with SLI tend to omit initiating events, attempts, internal responses and consequences compared to age-matched TD children. Global aspects of story-telling, including quantity and quality of goal-directed events, internal state expressions and inferencing strategies have also been found to be fragile in children with SLI (Soodla & Kikas, 2010; Bishop & Donlan, 2005; Reilly et al., 2004; Manhardt & Rescorla, 2002). Other studies of narratives of children with SLI have provided conflicting evidence regarding their planning and discourse organization skills. Merrit and Liles (1987) did not find significant differences between children with SLI and age-matched controls at the macrostructure level. Similarly, Norbury and Bishop (2003) did not find between-group differences in realizing initiation, attempt and resolution. There are even studies showing that monolingual children with SLI performed at comparable levels with their TD peers (Olley, 1989; Dodwell & Bavin, 2008; Ukrainetz & Gillam, 2009) or even outperformed them at the macrostructure level. Clear evidence in favor of benefits stemming from bilingualism in SLI children's use of reference has been provided by Jaber's study (in Armon-Lotem, 2010) with English-Hebrew bilingual children with SLI and monolingual Hebrew-speaking children with SLI. The former group exhibited more pragmatically-appropriate patterns of referential forms in their narratives compared to monolingual children with SLI. Bilingual SLI children's efficient pronoun choices have been attributed to the use of positive between-language transfer of referential form-to-meaning mappings.

THE PRESENT STUDY

Though there is general consensus that children with SLI produce significantly impoverished narratives when compared to TD children, the studies focused on microstructure, i.e. on isolated grammatical or/and lexical skills which present a fragmented view of the children's linguistic competence. The first objective of the present study was to evaluate a wide range of microstructural aspects of children's narratives by means of the LITMUS-MAIN tool (Gagarina et al., 2012) that has been specifically developed to screen and identify children at risk for SLI across over twenty languages. Specifically, we aimed to identify which aspects of microstructure in narratives would be more affected in both monolingual and bilingual children with SLI relative to TD groups thus highlighting language-specific areas as potential indicators for SLI in current clinical practice. According to well-documented patterns of language deficits in populations with SLI, we expected that functional items would be more vulnerable than content words. We thus expected the number of subordinate clauses and the number of function words to be considerably more reduced in children with SLI relative to TD controls. In contrast, no between-group differences in lexical diversity were predicted to emerge due to the fact that lexical abilities in children with SLI are relatively more preserved than their grammatical abilities (Van der Lely, 2005; Friedmann & Novogrodsky, 2004, 2007; Novogrodsky & Friedmann, 2006). In comparison with TD children, lower use of function words and complex clauses manifests impairment of morphosyntax in both monolingual and bilingual groups of children with SLI and could serve as a reliable index of language-specific impairment. By extension, lower use of subordination in SLI data is expected to affect the overall length of the narrative.

The study's second objective was to investigate whether bilingualism would confer a general advantage in the performance of bilingual groups with and without SLI. Besides the complications related to bilingual language processing, and more specifically to the cognitive effort of having to monitor language processing and language production in a competing context of two activated languages, bilingualism in TD children has been reported to bestow a general cognitive benefit relative to monolingual peers (Astheimer et al., 2014; Greenberg et al., 2013; Morales et al., 2013). Though there is still a critical gap in our knowledge regarding the specific nature of the cognitive control benefits in TD bilingual children (and more so in bilingual children with SLI), a number of studies have provided evidence in favor of enhanced inhibition and cognitive flexibility (Foy & Mann, 2013; Bialystok, 2011), as well as in ToM and pragmatic abilities (Bialystok, 2009; Goetz, 2003). A unique feature of bilingual development is that children have the opportunity to transfer what they know in their first or stronger language to support development in their second language and vice versa (MacWhinney, 2005; Armon-Lotem et al., 2008; Francis, 2000), thus, suggesting that transfer is abstract and not tied to morphosyntactic and lexical content. Such conceptual transferability is assumed to require executive function skills that promote children's ability to cope with transfers involving conflict, selective attention, switching or inhibition. Thus, in contrast to monolingual children bilingual peers should be more flexible in planning transfer of information between languages.

Our expectation was that the narrative performance of bilingual children would be enhanced in various aspects of macrostructure, and more specifically, at the level of internal state term attribution and story comprehension, i.e. the ability to establish deep-level links between propositions, such as cause and consequence. These predictions were mainly based on earlier findings showing that bilingual children condition and contextualize episodic knowledge like perspective-taking and meta-awareness of the protagonists' intentions and emotions in a more integrative manner than monolingual peers (Chen & Yan, 2011). Further studies have shown that TD bilingual children performed similarly to TD monolinguals peers across a number of narrative skills, including story structure, affective information, metacognitive statements and temporal links, though there was little transfer of knowledge of lexis or morphosyntax (Pearson, 2002; Uccelli & Páez, 2007). Crucially, story grammar analyses in the specific studies provided strong support for cross-language transfer of higher-order narrative composites, such as overall narrative clarity, but lack of transferability of lower-order categories, such as vocabulary and morphosyntax. Based on these findings, we also expected that TD bilingual children of the present study would show intact or even superior narrative skills at the macrostructural level relative to their TD monolingual peers. This selective benefit, though, was expected to be modest for bilingual children with SLI as compared to the advantages conferred for the bilingual unimpaired children due to the weaker control over the two languages as a result of language impairment in the former group.

Though previous work strongly suggests that children with SLI experience considerable delay in applying micro- and macrostructure rules compared to TD peers, our understanding of how bilingualism affects the narrative abilities of children with SLI remains limited. The recruitment of bilingual children with a diagnosis of SLI has been mainly dictated by the fact that bilingualism is an increasing trend in today's world population due to mass immigration and globalization. As already mentioned, our understanding of bilingual children with SLI has been limited to the prevalence of the double-delay hypothesis (Orgassa & Weerman, 2008; Steenge, 2006) claiming that deficient production choices are expected in the language performance of bilingual children with SLI due to the cumulative effects of limited processing capacity attributed to the language deficit and the longer time needed to establish strong functional connections between their L1 and L2. A number of studies have provided evidence that the coexistence of SLI and bilingualism gives rise to different types of language errors in comparison to the errors made by bilingual children without language impairment. For instance, Armon-Lotem and colleagues (2008) have reported considerably more substitution errors for subject-verb agreement in a group of bilingual children with atypical language development than in unimpaired children. The same pattern was found for bilingual English-Hebrew bilingual children with SLI who were reported to make more omission and substitution errors in preposition use than TD bilingual children (Armon-Lotem et al., 2010). The specific types of errors in bilingual children with SLI could not be traced to code interference, thus, they were considered by the authors to be reliable indicators of SLI in the bilingual populations. The specific findings raised the question whether bilingual children with SLI show a double-delay (Paradis et al., 2003; Paradis et al., 2005/6), and whether bilingualism and SLI are "two of a kind" (Crago & Paradis, 2003), thus, rendering the identification of reliable markers of SLI in bilingual children much more complex.

Drawing on a pool of narrative production data collected by age-matched monolingual and bilingual children with and without SLI we aimed to identify specific indicators of SLI in both monolingual and bilingual children, with performance across narrative levels (micro- vs. macrostructure) being used as the discriminating predictor of SLI indices. Specifically, we aimed to investigate whether the distinction between bilingualism and SLI effects can be accomplished by examining separately two levels of language analysis of children's narratives, namely, the microstructural level that focuses on text-based grammatical information, and the macrostructural level that involves the story components and engages abstract representations shared with cognition and ToM capacities. Our main prediction was that the microstructure of children's narratives would be affected by language impairment whereas bilingualism would affect children's narrative planning and internal state term attribution which are relevant to the interface between linguistic and cognitive processing. So, rather than capturing the distinction between language deficiency and bilingualism in terms of a double-delay or a "two of a kind" characterization of the language phenotype of the specific population, we expected that the impact of language dysfunction and bilingualism on bilingual children with SLI would be divergent depending on the level at which narrative performance would be evaluated, i.e. the micro- and macrostructural level.

Method

Participants. Our participants were four groups of children; twenty-one monolingual Greek-speaking children with SLI (7 boys, mean age: 9;3 yrs.), fifteen bilingual children with SLI (8 boys, mean age: 9;1 yrs.), and two groups of age-matched TD monolingual (14 boys, mean age: 9;0 yrs.) and bilingual children (14 boys, mean age: 9;1 yrs.). There was no significant difference in chronological age among the groups (p = .982). The TD children were recruited from a mainstream primary school in Thessaloniki, Northern Greece. Selection criteria specified that they had normal hearing and no speech, emotional or behavior problems, or observed neurological or severe articulation/phonological deficits. Formal written consent was obtained from the children's parents prior to participation in the study.

Children with SLI were recruited from a diagnostic center in central Greece. They had a speech and language therapist's/clinician's diagnosis of receptive or/and expressive SLI in the absence of any hearing losses, obvious neurological dysfunctions or motor deficits. Prior to data collection, both monolingual and bilingual children with SLI were administered the Greek version of WISC-III (Wechsler, 1992; adapted in Greek by Georgas et al., 2003); only children whose verbal abilities were at least 2 *SD*s below the expected normative mean of chronologically age-matched peers and with non-verbal scores within the normal limits for their chronological age (Bloom & Lahey, 1978) were recruited for the study. Moreover, parental questionnaires and language unit class teachers' reports were used to confirm delays in early language milestones and expressive difficulties in the children's oral and written speech output, respectively (Leonard, 1998). The overwhelming majority (N=11) of biSLI children were Albanian-Greek, while one Bulgarian-Greek, one English-Greek, one Romanian-Greek and one Ukranian-Greek participant were also included. On the other hand, all the age-matched TD bilingual children were Albanian-Greek, except for one German-Greek boy and one Bulgarian-Greek girl. Children's socioeconomic status (SES) was measured by maternal education (Psaki et al., 2014; Blair et al., 2011; Rhoades et al., 2011). There was a significant group effect (F (3, 71) = 7.474, p=.000), which has stemmed from the fact that the mothers of TD monolingual children had significantly more years of education than the mothers of monolingual children with SLI (p= .008), TD bilingual children (p = .001) and bilingual children with SLI (p = .002). There were no significant differences observed among monolingual children with SLI, TD bilingual children, and bilingual children with SLI (p>.748) (see Table 1 for more details on the groups' ages and maternal education).

[Table 1 about here]

Language assessment. A battery of assessments was administered to measure children's morpho-syntactic abilities, working memory and vocabulary knowledge in Greek as possible predictors of their narrative performance at the micro- and macrostructural level.

Sentence Repetition (SR) test (Diagnostic Verbal Intelligence Quotient/DVIQ (Stavrakaki & Tsimpli, 2000). The specific test was developed by Stavrakaki and Tsimpli (2000) to determine language development in 6-9 year old Greek-speaking children. Sentence repetition tests have been most widely used to measure the expressive language skills among TD children, as well as children with abnormal language development, including SLI (Conti-Ramsden et al., 2001; Archibald & Joanisse, 2009; Seeff-Gabriel et al., 2010; Thordardottir & Brandeker, 2012). An individual's ability to repeat an utterance, besides depending on working memory, necessitates the use of syntactic knowledge to chunk constituents and morphosyntactic information in ways which will be easy to retain and recall (Potter & Lombardi, 1998; Riches et al., 2010; Vinther, 2002). The sentence repeated is not a passive copy but a reconstruction of the sentence heard, thus reflecting syntactic competence (Lust et al., 1996). The SR test used in the present study consisted of ten sentences of increasing syntactic difficulty, namely, active transitive, passive, conditional, subject & object relative, subjunctive and interrogative clauses. Each child was required to repeat each sentence verbatim after the examiner's presentation. Any mistake in repeated word, omitted word or wrong word was counted as an error. The participant scored three points for each sentence repeated correctly, while two points and a single point were awarded in case the child made one and two errors, respectively. In case the child made more than two errors while repeating a single sentence, s/he received zero points. The highest possible score was 30 points.

Backwards Digit recall. Working memory was assessed with a backwards digit recall task (Alloway, 2007). This is a span task in which the amount of items to be remembered increased progressively over successive blocks containing 6 trials each. The criterion for moving on to the next block was correct recall of 4 out of the 6 trials. Test administration stopped if the child failed 3 trials in one block. The task consisted of 6 blocks, starting with 2 digits in block one and increasing to sequences of 7 digits in the last block. The highest score obtained on the task was 36.

Word Finding Test (Vogindroukas et al., 2009; adaptation from Renfrew (1997)). The test assesses children's expressive vocabulary which has also been shown to be vulnerable in SLI (Fletcher & Peters, 1984; Rice et al., 1994). The specific test consisted of 50 black-and-white pictures depicting commonplace objects which each child was required to name. Testing stopped when the child either finished all naming trials or failed to respond correctly in five consecutive trials. Each correct naming was given one point, so that the maximum score was 50.

Narrative measures. Children's narratives were assessed with the LITMUS-MAIN tool (Gagarina et al., 2012). The LITMUS-MAIN has been developed as a tool for the assessment of narrative abilities of children by a workgroup of COST Action IS0804. The LITMUS-MAIN has been developed after extensive pilot studies with more than 500 children in 26 different languages and language combinations. It was translated into Greek and piloted in Greek-speaking monolingual and bilingual children populations (e.g. Peristeri et al., in Gagarina et al., 2012). The specific tool comprised four parallel stories, each with a carefully designed six-picture sequence that have been controlled for cognitive and linguistic complexity, parallelism in macro- and microstructure, as well as cultural appropriateness. The LITMUS-MAIN provides examiners with a choice of elicitation procedures, namely telling (story generation) or retelling. The present study has focused on the retelling mode to avoid large inter-individual variability caused by narrative length differences and, thus, allow the study's power to view the effect of bilingualism on SLI children's narrative performance without the results being greatly overshadowed by within-group variability.

Materials. A standard set of materials was used for the elicitation of narratives (see Introduction; Gagarina et al., 2012) but for the sake of readers of individual articles in this special issue, the materials are being briefly described here. The two stories used for retelling were the *dog* and *cat* stories having four main characters (MCs) each. Along with narrative production, the study has also tested children's comprehension skills through a set of ten questions per story. The design of the questions was the following: three questions elicited goal statements, another group of six questions elicited internal state terms connected either to the initiating event or to the characters' reaction to events in the story, and the final question aimed at eliciting internal state terms of one of the MCs of the story.

Procedure. Each child was seen individually at the location most convenient for the child's parents (i.e. the diagnostic center or child's home). In the retelling task, the child was shown three colored envelopes on the computer screen and was asked to open one of them which included one of the stories. Then the child heard the story with headphones to promote high-quality audio sound while being shown two pictures at a time. After listening to the whole story, the child was then asked to retell the story to the examiner who was not present in the testing room. The examiner reminded the child that she did not know the story and could not see the pictures. The retelling mode provided information about how much of the original model-story the child could recall including lexical items and grammatical structures. Finally, after the child's retelling of the story, (s)he was asked a set of comprehension questions. Data collection took place over a period of one month. All experimental sessions were recorded using a digital voice recorder. During these sessions, the examiner provided motivators (verbal reinforcement, snack at end of session) as needed, but refrained from making any corrections. Each child was exposed individually to the same test protocols and procedures to ensure the reliability of the assessments.

Transcription of narrative samples and codification. Two of the authors have transcribed the children's narrative samples. Story narratives were transcribed using MAIN (Gagarina et al., 2012) conventions. The two authors that undertook the transcription of the samples randomly selected 25% of the total number of samples (i.e. 18 retelling productions per picture-story) to transcribe for reliability purposes. The author who conducted the experimental session originally transcribed the narrative samples and all re-transcriptions took place approximately one month later. Transcripts were compared on a word-by-word basis and agreement was calculated by dividing the total number of words in agreement by the total number of words included in the original transcriptions. The percentage agreement mean (and range) for the narrative samples was 97.2% (91.0% - 99.7%). With respect to the coding procedure, microstructure measures included a wide range of linguistic features, such as number of different words (i.e. lexical diversity), ratios of subordinate clauses, and number of content and function words. In order to calculate narrative length, both CUs and number of clauses were measured. Macrostructure measures, on the other hand, included the evaluation of structural complexity expressed through story structure composites and internal state terms. Specifically, structural complexity was measured by calculating the number and structure of episodes per story. Each story was divided into three episodes with each one of them consisting of (i) a Goal for the MC, (ii) an Attempt by the MC to reach the goal, and (iii) an Outcome of the attempt in terms of the goal. To calculate internal state terms we considered perceptual verbs (such as *see*, *hear*), physiological terms (such as, *thirsty, hungry*), lexical items expressing emotion (e.g. *sad*, *angry*), linguistic verbs or else known as verbs of saying (such as *shout*, *say*) and mental verbs (such as *think*, *wonder*) (see Gagarina et al., 2012 for more details on the scoring procedure). Twenty-five percent of the transcribed narrative samples were randomly selected and independently scored by two of the authors. The output was checked to identify instances of omissions or double coding. The percentage agreement mean (and range) for the scoring of the narrative samples was 98.4% (95.9% - 100.0%). Differences between ratings were discussed and changes were made where necessary. The adjusted ratings were then used for the statistical analyses.

Results

Statistical analyses were first conducted on the children's scores in the language assessment measures in order to test for group differences in expressive vocabulary, sentence repetition and verbal working memory. Separate statistical analyses were then conducted on group performance in microstructure (i.e. length, lexical diversity, ratios of subordinating constructions, function and content words) and macrostructure (i.e. internal state terms, story structure and story comprehension) in order to examine whether there were SLI and bilingualism effects specific to the two levels of narrative analysis (i.e. micro- and macrostructure), and whether the nature of these effects were confounded by children's SES, as well as variables related to their language competence, more specifically, vocabulary, sentence repetition and verbal working memory. Finally, groups' scores on both microstructure and macrostructure variables were included in multiple regression analyses with Language Impairment and Bilingualism as the independent variables, in order to single out the variable(s) that mostly impacted the groups' retelling performance along the micro- and macrostructure parameters.

Results on language assessment

Table 2 provides a summary of the descriptive statistics of the children of each group with regard to word finding, sentence repetition and backwards digit recall scores.

[Table 2 about here]

Analyses of variance (one way ANOVAs) showed significant group effects for all three measures (F (3,71) = 14.887, p = .000 for word finding, F (3, 71) = 25.749, p = .000 for sentence repetition, and F (3, 71) = 117.070, p = .000 for backwards digit recall). Subsequent post-hoc tests revealed that monolingual children with SLI have scored significantly lower than both TD groups in the word finding test (p = .000 for the difference between monolingual children with SLI and TD monolingual children, and p = .002 for the difference between monolingual children with SLI and TD bilingual children), while bilingual children with SLI have scored significantly lower than TD monolinguals only (p = .001). There was no significant difference found either between the two SLI groups (p = .292) or between the two TD groups (p = .162). With respect to the sentence repetition task, post-hoc tests revealed that both monolingual and bilingual children with SLI have scored significantly lower than both TD groups (p= .000 for the difference between monolingual SLI and both TD groups, p = .029 for the difference between bilingual SLI and TD bilingual children, and p = .000 for the difference between bilingual children with SLI and TD monolingual children), while TD bilingual children scored significantly lower than TD monolingual children (p = .028). Finally, both TD groups were found to score significantly higher than both groups with SLI in the backwards digit recall test (p = .000 for all differences), while there was no significant difference found either between

TD monolingual and TD bilingual children (p = .159) or between the two SLI groups (p = .348).

Results on microstructure

Table 3 provides a summary of the descriptive statistics of the children in each group with regard to their scores in the microstructure variables, more specifically, narrative length measured in terms of both CUs and number of clauses according to the MAIN guidelines (Gagarina et al., 2012), number of function and content words, and, finally, number of different words (i.e. lexical diversity) and ratios of subordinating constructions calculated as percentage of subordinate constructions out of CUs. Because the four groups (TD monolingual children, TD bilingual children, monolingual children with SLI, and bilingual children with SLI) differed in terms of SES, expressive vocabulary, sentence repetition and verbal working memory, scores on microstructure were first analyzed with each one of the four measures as covariates in separate analyses of covariance (ANCOVA) in order to determine whether any of them might better predict children's performance for each microstructural variable. An alpha level of 0.05 was used in all analyses.

[Table 3 about here]

An ANCOVA analysis was performed with group (TD monolingual, TD bilingual, monolingual children with SLI, bilingual children with SLI) as the between-subjects variable, number of CUs as the dependent variable, and SES as well as each one of the three language assessment measures as the covariates. All four covariates were found to be unrelated to the number of CUs ($p > .210$), and the effect of group was not significant (F (3, 71) =1.635, p = .190). Given that none of the four covariates was found to be a significant factor in children's performance, CU ratings were then analyzed without covariates in an ANOVA analysis with group as the between-subjects factor. The analysis has revealed a significant group effect (F (3, 71) = 11.827, p = .000), which was due to the fact that both TD groups have produced significantly more CUs than both SLI groups (p = .000 for both comparisons between TD monolingual vs. monolingual SLI and bilingual SLI children, and p = .002 and p = .001 for the comparisons between TD bilingual vs. monolingual children with SLI, and TD bilingual children vs. bilingual children with SLI, respectively). The differences between the two SLI groups, as well as between the two TD groups were not significant (p = .928 and p = .999, respectively).

The same ANCOVA analysis was conducted with number of clauses as the dependent measure. All four covariates were found to be unrelated to the number of clauses produced p>.078) and the group effect was also non-significant (F (3, 71) = 2.540, p = .064). The ANOVA analysis, however, has shown a significant group effect (F (3, 71) = 19.368, p = .000) for clauses, which stems from the fact that TD bilingual children have produced significantly more clauses than TD monolingual children (p = .012) and both SLI groups (p = .000 for both differences), while TD monolingual children were found to score significantly higher in number of clauses than both SLI groups (p = .001 for the difference between TD monolingual children and monolingual children with SLI, and p = .005 for the difference between TD monolingual children and bilingual children with SLI). There was no significant difference in number of clauses (p = 1.0) observed between monolingual SLI and bilingual SLI groups.

Further analyses were conducted on the group scores on the rest of the microstructure variables included in the study, such as content, function words and lexical diversity. We should mention that we did not run any within-group statistical analyses on the use of function vs. content words since they correspond to a closed- and an open-class, respectively, such that content words are always bound to be more in any population. The ANCOVA analyses with group as the between-subjects variable, content and function words as the dependent variables, and SES, vocabulary, sentence repetition and working memory scores as the covariates revealed no mediating effects for either of the four covariates ($p > .087$ for content words, and $p > .151$ for function words); no significant group effects were observed either (F (3, 71) = 1.421, $p = .245$ for content words, and F (3, 71) = 1.531, $p = .215$ for function words). On the other hand, separate ANOVA analyses have revealed significant group effects for both content (F (3, 71) = 2.946, $p = .039$) and function words (F (3, 71) = 6.750, $p = .000$). Subsequent post-hoc analyses have shown that the group effect in the use of content words was due to TD bilingual children's significantly higher scores than monolingual children with SLI ($p = .045$). There were no significant differences found either between the two TD groups ($p = .523$) or between the two SLI groups ($p = 1.0$). Moreover, TD monolingual children's score in content words did not differ significantly from the SLI groups ($p = .482$ for the difference with monolingual children with SLI, and $p = .623$ for the difference with bilingual children with SLI). On the other hand, the group effect in the use of function words was attributed to the fact that TD bilingual children have scored significantly higher than both SLI groups ($p = .003$ for the difference between TD bilingual children and monolingual children with SLI, and $p = .001$ for the difference between TD bilingual children and bilingual children with SLI), while the difference between TD monolingual children and bilingual children with SLI was marginally significant ($p = .060$). There were no significant differences found either between the two TD groups ($p = .333$) or between the two SLI groups ($p = .946$). The ANCOVA analysis conducted for lexical diversity revealed that the use of different words was significantly sensitive to verbal working memory (F (1, 71) = 4.962, $p = .029$) and that the group effect was also significant (F (3, 71) = 4.469, $p = .007$). Subsequent post-hoc analyses showed that such effect has stemmed from bilingual SLI children's significantly lower lexical diversity scores in comparison to monolingual children with SLI ($p = .009$). No significant differences were observed between

TD monolingual children and the two SLI groups ($p > .180$), between TD bilingual children and the two SLI groups ($p > .084$), and between the two TD groups ($p = .827$).

Finally, SES and the language assessment covariates were found to have no significant effect on children's performance in subordination ($p > .130$), while no significant group effect was found either (F (3, 71) = 2.552, $p = .063$). A one-way ANOVA analysis, however, has shown a significant group effect (F (3, 71) = 6.113, $p = .001$) which was due to TD bilingual children's significantly higher rates of subordination relative to the rest of the groups ($p = .002$ for the difference with TD monolingual children, $p = .001$ for the difference with monolingual children with SLI, and $p = .023$ for the difference with bilingual children with SLI). There were no differences observed either between TD monolinguals and the two SLI groups ($p > .951$) or between the two SLI groups ($p = .894$).

Results on macrostructure

*Results on internal state terms use***.** Table 4 provides a summary of the descriptive statistics of the participants in each group with regard to their scores on internal state terms.

[Table 4 about here]

For reasons of space, paired-samples t-tests conducted on the use of internal state terms by each group have been included in Table 5, while we will limit ourselves to the most striking differences stemming from each group's strong preferences in the use of specific types of internal state terms over others. Typically-developing monolingual children produced significantly more physiological terms than almost any of the other terms, while linguistic terms appeared to be less preferred than perceptual, physiological and emotion terms. With respect to TD bilingual children, physiological terms were the least preferred, while linguistic terms were also significantly less produced than perceptual, emotion and mental terms. Interestingly, emotion terms were preferred significantly more than both physiological and linguistic terms. With respect to the monolingual group with SLI, the frequency of using physiological terms was found to be significantly higher than both emotion and linguistic terms, while rates of linguistic terms were found to be significantly lower than perceptual, physiological and mental terms. Finally, linguistic terms had the lowest scores in bilingual children with SLI relative to the rest of the internal state term categories.

[Table 5 about here]

We next conducted analyses of covariance (ANCOVAs) with group (TD monolingual, TD bilingual, monolingual children with SLI, bilingual children with SLI) as the between-subjects variable, each of the internal state term categories (physiological, perceptual, emotion, linguistic and mental terms) as the dependent variable, and SES as well as each of the three language assessment measures as the covariates. All four covariates were found to be unrelated to the use of physiological, perceptual, linguistic and emotion terms ($p > .170$), yet, the effect of group was found to be significant for physiological (F (3, 71) = 12.090, $p = .000$), linguistic (F (3, 71) = 13.245, $p = .000$), and emotion terms (F (3, 71) = 12.672, $p = .000$). Subsequent post-hoc analyses have shown that TD monolingual children tended to use significantly more physiological terms than the rest of the groups ($p = .020$ for the difference with monolingual children with SLI, and $p = .000$ for the difference with both TD bilingual children and bilingual children with SLI). Furthermore, both TD groups tended to use significantly more linguistic terms than both SLI groups, ($p = .000$ for all differences), while TD bilingual children have marginally outperformed TD monolingual children for the same category ($p = .051$). With respect to the use of emotion terms, TD bilingual children outperformed the rest of the groups (*p* = .05 for the difference with TD monolingual children, *p* = .000 for the difference with monolingual children with SLI, and *p* = .002 for the difference with bilingual children with SLI); moreover, monolingual children with SLI were found to score significantly lower than both TD monolingual (*p* = .000) and bilingual children with SLI (*p* = .05) for the emotion term category. One-way variance analyses have also shown a significant group effect for the use of perceptual terms (*F* (3, 71) = 9.638, *p* = .000), which was due to the fact that both TD groups tended to use significantly more perceptual terms than monolingual children with SLI (*p* = .000 for both differences), while TD monolingual children produced higher proportions of physiological terms with respect to the rest of the groups (*p* = .000 for all differences). Working memory scores were found to have a significant mediating effect on children's performance in mental term use (*F* (1, 71) = 5.043, *p* = .028), yet, the group effect for the specific internal state term category was abolished (*F* (3, 71) = 1.999, *p* = .123).

Results on Story structure composite & Comprehension scores. Table 6 provides a summary of the descriptive statistics of the children in each group with regard to their scores on story structure complexity and comprehension questions.

[Table 6 about here]

Analyses of variance (ANCOVAs) with group (TD monolingual, TD bilingual, monolingual children with SLI, bilingual children with SLI) as the between-subjects variable, and SES as well as each of the three language assessment measures as the covariates were conducted separately for the story structure and the comprehension scores. All four covariates were found to be unrelated to story structure complexity (*p* > .090), while the group effect was also non-significant (*F* (3, 71) = 2.777, *p* = .104). A one-way ANOVA analysis without covariates has revealed a significant group effect (*F* (3, 68) = 7.035, *p* = .000), which has stemmed from the fact that TD bilingual children have scored significantly higher than both monolingual groups that participated in the study, i.e. TD monolingual (*p* = .027) and monolingual children with SLI (*p* = .000). Crucially, bilingual children with SLI were found to score significantly higher than their monolingual SLI peers (*p* = .040).

Finally, the same ANCOVA analysis with children's comprehension scores as the dependent variable has shown no significant effects for any of the covariates ($p > .143$) neither a significant group effect (F (3, 71) = .635, p = .595). An ANOVA analysis, yet, has revealed a significant group effect (F (3, 68) = 22.900, p = .000), which was due to both TD groups' scoring significantly higher than both SLI groups (TD monolingual children: *p* = .000 for the difference with monolingual children with SLI and *p* = .001 for the difference with bilingual children with SLI, TD bilingual children: *p* = .000 for the difference with monolingual children with SLI and *p* = .002 for the difference with bilingual children with SLI). Crucially, bilingual SLI children's comprehension scores in the narratives appeared to be marginally higher than those of their monolingual peers with SLI (*p* = .06).

Regression analyses: The role of Language Impairment and Bilingualism on narrative micro- and macrostructural performance

We performed a series of analyses to see if the variables of Language Impairment and Bilingualism potentially characterized groups' performances on both microstructure (i.e. production of content and function words, use of subordination) and macrostructure variables (i.e. use of internal state terms collapsed across types, story structure complexity, and comprehension accuracy). Multiple regression analyses were conducted with Impairment and Bilingualism as the independent and micro- and macrostructure measures as the dependent variables.

The total amount of variance accounted for by the two predictors, i.e. Language Impairment and Bilingualism, was statistically significant for all the dependent variables used in the regression analyses. More specifically, both independent variables were found to predict performance in both micro- and macrostructure, accounting for 10.5% of the variance for content words (F (2, 68) = 4.028, p = .022, R^2 = .105, $R^2_{Adjusted}$ = .079), 20.1% for function words (F (2, 68) = 8.673, p = .000, R^2 = .201, $R^2_{Adjusted}$ = .178), 16% for subordination (F (2, 68) = 6.595, p = .002, R^2 = .160, $R^2_{Adjusted}$ = .136), 27.1% for internal state terms (F (2, 359) = 66.524, p = .000, R^2 = .271, $R^2_{Adjusted}$ = .267), 23.7% for story structure complexity (F (2, 71) = 10.701, p = .000, R^2 = .237, $R^2_{Adjusted}$ = .215), and 36.2% for comprehension accuracy (F (2, 71) = 19.586, p = .000, R^2 = .362, $R^2_{Adjusted}$ = .344). Language Impairment, however, was the only variable to make a unique contribution to the overall variance of children's performance on content (p = .010 for Language Impairment and p = .302 for Bilingualism) and function word use (p = .000 for Language Impairment and p = .425 for Bilingualism), while Bilingualism was the only variable that added statistically significantly to the prediction of children's performance in subordination use (p = .066 for Language Impairment and p = .003 for Bilingualism) and comprehension accuracy (p = .965 for Language Impairment and p = .000 for Bilingualism). On the other hand, both Bilingualism and Language Impairment were found to add significantly to the prediction of children's performance in story structure complexity (p = .022 for Language Impairment and p = .000 for Bilingualism) and internal state term use (p = .000 for Language Impairment and p = .010 for Bilingualism).

DISCUSSION

In this study, we set out to investigate the narrative performance of monolingual and bilingual children with a diagnosis of SLI along with the performance of age-matched TD monolingual and bilingual children. Previous work (e.g. Befi-Lopes et al., 2008; Berman & Nir-Sagiv, 2004;

Pearce et al., 2010) has shown that narrative performance is a robust indicator of SLI in children and associated with the emergence of language dysfunction markers related to SLI symptoms. However, the generalizability of the behavioral profile of monolingual children with SLI as established by narrative performance to bilingual children with SLI is underexplored. In the present study, we drew on the micro- and macrostructural properties of both monolingual and bilingual SLI children's narratives to test the prediction that low-level language deficits evident at the microstructural level of narratives are persistent in the performance of bilingual children with SLI, but higher-level macrostructural properties including narrative organization and complexity, as well as attribution of affective states are largely preserved due to being mediated by domain-general cognitive mechanisms enhanced by bilingualism rather than language-specific mechanisms compromised by the language disorder. Specifically, we predicted that the encoding of macrostructure through narratives in bilingual children with SLI would be relatively immune to language impairment, contrary to the case of monolingual children with SLI. Indeed, results suggest that the detection of SLI and bilingualism effects in the two populations is paralleled by distinct performances in the micro- and macrostructural level of narrative performance.

More specifically, the present study provides evidence that microstructural elements and forms of the narrative discourse can play a crucial role in detecting language impairment in both monolingual and bilingual children. Narrative length measured either by communication units or number of clauses appeared to be a robust index of language impairment, since both SLI groups obtained considerably lower narrative length scores than TD groups. Beyond corroborating previous studies showing reduced overall length in the narratives of monolingual children with SLI (Bol & Kuiken, 1988; Zwitserlood, 2007; Fey et al., 2004; Reilly et al., 2004; Scott & Windsor, 2000), our findings show that narrative length can be taken as a clinical marker for SLI in bilingual populations as well. The same pattern of performance was observed for function words, with TD groups producing significantly more exemplars than both SLI groups. In addition to length and function word use, robust differences between TD and SLI groups were also observed in sentence complexity measures, with both SLI groups exhibiting considerably lower use of subordination relative to both monolingual and bilingual TD children. Interestingly, the difference between SLI and language-unimpaired children in subordination persisted even when controlling for important language confounds, such as working memory. This implies that hierarchical representations of discourse structure analogous to subordinate clause production placed high cognitive load on both monolingual and bilingual children with SLI during their retelling performance. Group differences in SES, vocabulary and sentence repetition were not large enough to be evident in microstructure measures, at least under the narrative task demands of the current study.

While the use of independent functional categories and sentence structural complexity reflected though the use of subordinate clauses proved to be marked areas of difficulty for children with SLI (see also Bol & Kuiken, 1988; Bishop & Donlan, 2005; Fey et al., 2004; Gillam & Johnston, 1992; Norbury & Bishop, 2003; Reilly et al., 2004 for similar findings), parallel conclusions about lexical diversity and use of content words reflecting pure SLI-driven effects are not warranted. More specifically, the analyses controlling for working memory constraints revealed that monolingual children with SLI showed greater lexical diversity in their retellings compared to their bilingual SLI peers which may be linked to the latter group's limitations of oral proficiency in Greek. Furthermore, we obtained no significant differences between the performances of TD and SLI groups in the use of content words, which suggests that both language-impaired and unimpaired groups were similar in their ability to choose content words that optimized the information rate and communicative efficiency of their narratives in contrast to morpho-syntactic elements (i.e. subordination & function words) that were more impaired in children with SLI (see Gillam & Johnston, 1992; Fey et al., 2004 for similar form vs. content dissociations in children with SLI).

Comparisons between the groups' performances at the macrostructural level, and more specifically on their ability to communicate the story characters' intentions, beliefs or desires, have also revealed significant differences between children with and without SLI. Linguistic verbs proved to be the most vulnerable internal state term category for children with SLI in comparison to TD groups. Under-production of linguistic verbs could be attributed to the effects of language impairment on subordination; since linguistic verbs select complement clauses they could be more affected in SLI groups' narratives than other verbs (de Villiers, 2005, 2007; Owen & Leonard, 2006). Physiological and perceptual terms were preferred by monolingual and bilingual children with SLI. These terms may be characterized as being more perceptually accessible from the visual stimuli accompanying each story in contrast to verbs referring to acts of speaking, such as *say* and *shout* which had to be largely drawn from language itself, thus, putting children with SLI at a disadvantage (Gillette et al., 1999). Crucially, the lack of group differences in the use of mental state terms when language assessment scores, including expressive vocabulary and sentence repetition, were controlled suggests that working memory (rather than an SLI-specific deficit) had a significant impact on both language-impaired and unimpaired children's verbally-mediated mentalizing/ToM ability. That mental verbs and working memory abilities are related to performance in narrative tasks is consistent with previous studies showing that children particularly susceptible to WM load had more difficulties in the acquisition and use of mental verbs (Spanoudis & Natsopoulos, 2011; Johnston et al., 2001).

The analyses conducted on the groups' use of emotion terms revealed differences between bilingual and monolingual groups, with the former showing significantly higher use of emotional language than the latter. The particular finding suggests distinct patterns of emotion word processing which may be related to the cognitive consequences of being bilingual. Emotion words are a special category of words that is rather dissociable from the world of beliefs and mental events, in the sense that affective terms have been shown to follow a distinct developmental trajectory in language acquisition by emerging before cognitive terms (Baldimtsi et al., 2014). Because use of affective terms was found to be significantly weaker in monolingual TD and SLI groups relative to bilingual children, we hypothesize that for bilingual children with and without SLI emotion words were, in general, more salient in the story presentation. This may be due to children's sensitivity to cross-linguistic differences in the expression of emotion as translational equivalents for emotion terms are not as common as those for other types of mental state terms (Chen & Yan, 2011; Pavlenko, 2008). Atypical mentalizing abilities have been shown, although not fully described in SLI (Farmer, 2000; Gillott et al., 2005), however, the perception and attribution of affect remains underexplored in the specific disorder and is indeed a very interesting venue for future investigation.

While SLI-driven effects were mainly evident on children's narrative performance in microstructure, both SLI and TD bilingual children's performance in story structure and comprehension revealed a bilingualism effect, suggesting an advantage for bilingual children in developing and understanding the global coherence of the stories relative to monolingual children. Specifically, measures of story grammar differentiated between TD bilingual children from both monolingual groups, while bilingual children with SLI were found to outperform their monolingual SLI children in story structure composite scores. In addition, bilingualism had beneficial effects on children with SLI who outperformed their monolingual peers with SLI in story comprehension suggesting that the bilingual advantage on global coherence observed in both bilingual groups is responsible for comprehension scores too. We thus suggest that the bilingual advantage evident in the higher performance of bilingual children with SLI in both story grammar and comprehension is due to the abstractness of story macrostructure which is more tightly linked to discourse representation rather than to narrow linguistic features of the context. It is possible that bilingualism boosts the ability to abstract language-independent narrative properties, thus, making narrative structure and coherence more accessible for bilingual children with SLI relative to their monolingual SLI peers.

To date, very few studies have investigated how the cognitive consequences of being bilingual are engaged by children as they are narrating a story. Iluz-Cohen and Walters (2012) have investigated TD and language-impaired bilingual preschool children's narrative production on a range of language measures. The specific study reports that bilingual children with and without language impairment were strikingly similar in terms of narrative macrostructure, but differed significantly in terms of their performance on a range of microstructure variables, including lexical and morpho-syntactic measures. In a recent longitudinal study, Squires and colleagues (2014) have tested kindergarten-to-first grade TD and language-impaired bilingual children on retelling wordless picture books in both their languages. Typically-developing children were found to outperform language-impaired children on both macro- and microstructure measures at both points in time (i.e. kindergarten and first grade). We claim that the bilingualism effects on SLI children's performance might have been stronger in the present study due to the age of the participants; at age nine, most bilingual children with SLI had the chance to gain sufficient exposure to both their L1 and L2, which potentially permitted the establishment of stronger inter-language connections. By consequence, they showed greater ease to abstract shared properties of narrative structure across their languages which characterize macrostructure. Crucially, our findings that the advantages conferred by bilingualism were mostly relevant to the groups' performance at the macrostructure level are further supported from the regression analyses. While Language Impairment appeared to influence performance on microstructure, Bilingualism was found to have more significant contributions to abstract, higher-order aspects of narration, including story structure complexity and comprehension.

CONCLUSIONS

Studies on the narrative development of monolingual children with SLI have largely contributed to better understanding how language impairment affects language processes along specific properties of narrative discourse. In particular, their narrative output has been described as being little informative and poorly organized. A new challenge for the use of narrative tools in language deficits has arisen in bilingual children being at risk of language impairment, since diagnosis requires the differentiation of the effects of bilingualism and language impairment. In the present study, we aimed at identifying clinical markers of language impairment in the narrative performance of a group of 5-11 year old bilingual children with SLI that were age-matched with three groups of monolingual SLI, TD monolingual and bilingual children. The measurements were able to highlight significant SLI effects on several properties of microstructure, including narrative length, use of subordination and function words. Furthermore, both SLI groups were found to perform poorly in the production of specific internal state terms, like linguistic verbs, presumably due to problems with subordination in the subcategorization structure of these verbs. Strong bilingualism effects, on the other hand, were revealed in the groups' performance on macrostructure, with bilingual children with SLI scoring at equal levels, and even outperforming, monolingual children with SLI in integrating the affective states of characters with the events in the story, in story structure complexity and overall story comprehension.

The overall results show that SLI effects were more pronounced in microstructure presumably due to their language-specific nature. On the other hand, the study has provided evidence of a positive impact of bilingualism on the production of narratives on macrostructure, possibly reflecting abstract structures shared between the two languages, as well as specific advantages in verbal planning at the interface between linguistic and cognitive processing. Further investigations of bilingual SLI children's functions of executive abilities, and interactions of executive functions and linguistic abilities on the text level, may shed more light on the nature of the distinct compensatory mechanisms allowing for the preservation of narrative abilities at the macrostructure level in bilingual children with SLI.

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Tables

Table 1. *Number (N) of Children, Mean Chronological Age - (SDs) - Age Range, and Maternal Education - (SDs) – Range of Mothers' Education in Years for Monolingual TD Children (hereafter, mo-TD), Monolingual Children with SLI (hereafter, moSLI), Bilingual TD Children (hereafter, biSLI), and Bilingual Children with SLI (hereafter, biSLI)*

Group	Chronological age Mean (*SD*) Age range	Maternal education Mean (*SD*) Range of years of education
mo-TD	9;0 (*2.2*)	14;6 (*1.7*)
(*N* = 21)	5;2-11;5	12;0-17;0
moSLI	9;3 (*1.8*)	12;1 (*2.6*)
(*N* = 21)	5;5-11;6	7;6-17;6
bi-TD	9;1 (*2.2*)	11;6 (*2.3*)
(*N* = 15)	5;5-11;9	6;0-16;0
BiSLI	9;1 (*1.7*)	11;4 (*2.6*)
(*N* = 15)	5;7-11;8	7;6-16;0

Table 2. *Groups' Mean Raw Scores (and SDs) on Word Finding, Sentence Repetition and Backwards Digit recall Test*

Group	Word Finding Mean (*SD*)	Sentence Repetition Mean (*SD*)	Backwards Digit Mean (*SD*)
mo-TD (*N* = 21)	41.8 (*6.0*)	28.7 (*1.6*)	25.4 (*4.4*)
moSLI (*N* = 21)	29.6 (*6.9*)	17.6 (*6.1*)	7.9 (*3.6*)
bi-TD (*N* = 15)	37.4 (*4.6*)	24.5 (*3.0*)	28.3 (*2.9*)
BiSLI (*N* = 15)	33.3 (*6.4*)	20.0 (*5.1*)	10.2 (*5.0*)

Table 3. *Groups' Mean Scores (and SDs) on Microstructure Variables*

Group	Length/communication units Mean (*SD*)	Length/verb-based clauses Mean (*SD*)	Lexical diversity Mean (*SD*)	Ratios of subordination Mean (*SD*)	Function words Mean (*SD*)	Content words Mean (SD)
mo-TD (*N* = 21)	12.7 (*2.9*)	21.5 (*4.7*)	55.6 (*12.0*)	41.4 (*0.10*)	39.3 (*9.6*)	45.4 (*8.2*)
moSLI (*N* = 21)	8.8 (*3.2*)	15.7 (*5.8*)	44.2 (*13.9*)	40.5 (*0.15*)	32.4 (*8.5*)	40.2 (*5.8*)
bi-TD (*N* = 15)	12.6 (*2.8*)	26.8 (*3.2*)	46.4 (*9.5*)	60.9 (*0.15*)	45.4 (*7.3*)	50.8 (*7.1*)
BiSLI (*N* = 15)	8.2 (*2.4*)	15.9 (4.*7*)	32.4 (*6.3*)	44.2 (*0.22*)	30.4 (*9.8*)	40.6 (*7.4*)

Table 4. *Groups' Mean Scores (and SDs) on Internal State Terms*

Group	Perceptual terms Mean (*SD*)	Physiological terms Mean (*SD*)	Emotion terms Mean (*SD*)	Linguistic terms Mean (*SD*)	Mental terms Mean (*SD*)
mo-TD (*N* = 21)	1.6 (*0.4*)	1.8 (*0.5*)	1.5 (*0.4*)	1.1 (*0.4*)	1.4 (*0.6*)
moSLI (*N* = 21)	0.8 (*0.7*)	1.0 (*0.5*)	0.6 (*0.8*)	0.3 (*0.5*)	0.8 (*0.8*)
bi-TD (*N* = 15)	1.9 (*0.5*)	1.0 (*0.1*)	2.1 (*0.4*)	1.6 (*0.3*)	1.9 (*0.5*)
BiSLI (*N* = 15)	1.3 (*0.7*)	0.8 (*0.3*)	1.2 (*0.8*)	0.4 (*0.5*)	1.0 (*0.8*)

Table 5. *Results of the Paired T-tests Conducted on Each Group's Scores on Internal State Term Use*

	Internal State terms				
mo-TD (*N* = 21)	Perceptual terms	Physiological terms	Emotion terms	Linguistic terms	Mental terms
perceptual	-	*t* (20) = 1.046, *p* = .308	*t* (20) = .608, *p* = .550	*t* (20) = 3.022, *p* = .007*	*t* (20) = 1.073, *p* = .296
physiological	*t* (20) = 1.046, *p* = .308	-	*t* (20) = 2.137, *p* = .045*	*t* (20) = 4.183, *p* = .000*	*t* (20) = 2.306, *p* = .032*
emotion	*t* (20) = .608, *p* = .550	*t* (20) = 2.137, *p* = .045*	-	*t* (20) = 3.068, *p* = .006*	*t* (20) = .476, *p* = .639
linguistic	*t* (20) = 3.022, *p* = .007*	*t* (20) = 4.183, *p* = .000*	*t* (20) = 3.068, *p* = .006*	-	*t* (20) = 1.465, *p* = .158
mental	*t* (20) = 1.073, *p* = .296	*t* (20) = 2.306, *p* = .032*	*t* (20) = .476, *p* = .639	*t* (20) = 1.465, *p* = .158	-
moSLI (*N* = 21)					
perceptual	-	*t* (20) = 1.022, *p* = .319	*t* (20) = .886, *p* = .386	*t* (20) = 2.276, *p* = .034*	*t* (20) = .088, *p* = .931
physiological	*t* (20) = 1.022, *p* = .319	-	*t* (20) = 2.542, *p* = .019*	*t* (20) = 4.863, *p* = .000*	*t* (20) = .987, *p* = .335
emotion	*t* (20) = .886, *p* = .386	*t* (20) = 2.542, *p* = .019*	-	*t* (20) = 1.783, *p* = .090	*t* (20) = 1.500, *p* = .149
linguistic	*t* (20) = 2.276, *p* = .034*	*t* (20) = 4.863, *p* = .000*	*t* (20) = 1.783, *p* = .090	-	*t* (20) = 1.783, *p* = .090
mental	*t* (20) = .088, *p* = .931	*t* (20) = .987, *p* = .335	*t* (20) = 1.500, *p* = .149	*t* (20) = 3.316, *p* = .003*	-
bi-TD (*N* = 15)					
perceptual	-	*t* (14) = 5.775, *p* = .000*	*t* (14) = 1.451, *p* = .169	*t* (14) = 1.964, *p* = .070	*t* (14) = .381, *p* = .709
physiological	*t* (14) = 5.775, *p* = .000*	-	*t* (14) = 8.500, *p* = .000*	*t* (14) = 6.874, *p* = .000*	*t* (14) = 6.439, *p* = .000*
emotion	*t* (14) = 1.451, *p* = .169	*t* (14) = 8.500, *p* = .000*	-	*t* (14) = 2.978, *p* = .010*	*t* (14) = .924, *p* = .371
linguistic	*t* (14) = 1.964, *p* = .070	*t* (14) = 6.874, *p* = .000*	*t* (14) = 2.978, *p* = .010*	-	*t* (14) = 2.219, *p* = .044*
mental	*t* (14) = .381, *p* = .709	*t* (14) = 6.439, *p* = .000*	*t* (14) = .924, *p* = .371	*t* (14) = 2.219, *p* = .044*	-
BiSLI (*N* = 15)					
perceptual	-	*t* (14) = 2.236, *p* = .042*	*t* (14) = .445, *p* = .663	*t* (14) = 5.281, *p* = .000*	*t* (14) = 1.417, *p* = .178
physiological	*t* (14) = 2.236, *p* = .042*	-	*t* (14) = 1.871, *p* = .082	*t* (14) = 2.567, *p* = .022*	*t* (14) = .959, *p* = .354

emotion	*t* (14) = .445, *p* = .663	*t* (14) = 1.871, *p* = .082	-	*t* (14) = 3.781, *p* = .002*	*t* (14) = .688, *p* = .503
linguistic	*t* (14) = 5.281, *p* = .000*	*t* (14) = 2.567, *p* = .022*	*t* (14) = 3.781, *p* = .002*	-	*t* (14) = 3.676, *p* = .002*
mental	*t* (14) = 1.417, *p* = .178	*t* (14) = .959, *p* = .354	*t* (14) = .688, *p* = .503	*t* (14) = 3.676, *p* = .002*	-

*$p < .05$.

Table 6. *Groups' Mean Scores (and SDs) on Story Structure Complexity (raw scores) and Story Comprehension Questions (%)*

Group	Story Structure Complexity Mean (*SD*)	Story Comprehension Mean (*SD*)
mo-TD (*N* = 21)	10.1 (*1.3*)	96.6 (*4.8*)
moSLI (*N* = 21)	9.3 (*1.1*)	60.5 (*8.3*)
bi-TD (*N* = 15)	11.4 (*1.9*)	97.6 (*4.5*)
BiSLI (*N* = 15)	10.6 (*1.4*)	74.6 (*10.8*)