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Language Complexity and Intersubjectivity in Narratives Written by Colombian Children

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Abstract

Language development depends on social aspects of cognition, such as intersubjectivity. Given the interdependence of patterns of language use and social cognitive aspects of communication, we question whether there is a measurable relation between lexico-grammatical complexity and the construction of intersubjectivity in children's narratives. We analyzed narrative texts using quantitative measures (grammatical and lexical complexity) and analyses of semiotic aspects for the construction of intersubjectivity. The results show that narratives with higher levels of intersubjectivity contain sentences that are more grammatically complex, as reflected by a higher proportion of subordinated clauses. These findings allow to conclude that social cognition processes play an important role in text production. Moreover, this study shows how the use of combined semiotic analysis and quantitative measures of lexical-grammatical elements makes possible a holistic approach to the written language study.

Keywords Language complexity · Social interactions · Intersubjectivity · Language use · Communicative interaction

Introduction

From a constructivist perspective, language is considered a tool through which cognitive structures are shaped and enriched (Bruner 1990; Tomasello 2014; Vygotsky 1978). Patterns of language use, including lexico-grammatical structure, may affect speakers' cognitive processes of conceptualization and the way the world is interpreted and perceived (Boroditsky 2011;

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Gentner and Christie 2010; Gentner and Goldin-Meadow 2003). Conversely, language development depends on the cognitive processes linked to social interactions (Tomasello 1999, 2003).

Empirical evidence demonstrates a close relationship between social cognition and language. For example, it has been found that the use of relational language enhances analogical thinking and that the use of terms of reference mediates the conceptualization of space (Christie and Gentner 2012). Also, the use of relational verbal tags influences the recall of memories, and the use of certain grammatical features influences the perception of past events (Jamrozik and Gentner 2013; Matlock et al. 2012).

Here, we explore the relationship between the use of lexico-grammatical elements and the construction of intersubjectivity in narrative discourse—a process involving cognitive representation of the self and the other.

Intersubjectivity and Language Use

According to socio-constructivist proposals (Tomasello 1999), the capacity to recognize intentional states in others is pivotal to language development. Social interaction influences how patterns of language use are produced. These patterns, in turn, relate to processes of abstract categorization, since they constitute regularities that are abstracted as operational schemas (Ibbotson and Tomasello 2009).

Vygotsky (1962) proposes that social and cultural factors mediate language development and that these factors are central to develop complex mental processes. During the first year of life, the development of the social function of language takes place, giving rise to the early emergence of communication resources. Vygotskian perspectives posit that language is a social process that emerges through the interactions of the child with others and that it becomes internalized and merges with thought, allowing a new form of behavior to begin (Vygotsky 1962). The interactive component of language development may result from "a natural disposition of the inherent intersubjectivity of human minds" (Popova 2014, p. 6).

The notions surrounding the term "intersubjectivity" have been central to philosophy and the study of social cognition and language from the Greek philosophers to thinkers, such as Heidegger, Vygotsky, and Tomasello (Stahl 2016). Tomasello (1999) notes that intersubjectivity—understood as the recognition of other people comprehension capabilities (so-called "theory of mind")—involves perspective taking (Vähämaa 2018), that is, the ability to view and comprehend the world from the other person's position, as well as the recognition of intentional states from early stages of life. According to this constructivist perspective—broadly endorsed by many authors (Akhtar 1999; Angel et al. 2009; Barrett 1986; Bowerman 1982; Dittmar et al. 2008; Hopper and Thompson 1980; Naigles 1990; Paul and Fillmore 1999; Tomasello 1992)—the way social interactions shape language development is twofold: on the one hand, the child's ability to recognize intentional states of others is a necessary condition for the grounding of meaning, expansion of the lexical repertoire, and bootstrapping of complex grammatical structures. On the other hand, patterns of production and use of prototypical grammatical forms mediate the abstraction (of categories) and conceptualization.

A growing bulk of empirical evidence supports this view (for a revision, see Ibbotson 2013). Recently, Rochat et al. (2009) propose that intersubjectivity can be conceptualized at different levels conform to the unfolding of development, from neonatal phases to older stages. They propose a "tertiary" form of intersubjectivity that involves first- and second-person reflective and recursive cognitive processes involved in communicative understanding, mediated by meta-representations and symbolic references to actual and fictional scenarios. This

capacity might be inherent to the ability of recognizing the intentional states of others during perspective-taking (Tomasello 1999). In other words, the notion that cognition encompasses communicative goals highlights the role that others play. This is because, understanding a social situation involves "putting oneself in another's place," and in turn, it involves constructing an intersubjective representation of the situation.

In the present study, we attempt to operationalize such notion of intersubjectivity by construing a way to account for the recursive cognitive processes that underpin written production of language. More specifically, the recursive and reflective intersubjective processes that occur during narrative construction are operationalized using semiotic analysis tools (e.g., Perinat 1995).

Semiotic Analysis and Construction of Intersubjectivity in Texts

Following Perinat (1995), we assume that constructing an intersubjective representation of the communicate situation involves perspective-taking, that is, the understanding of other's role in social situations and putting oneself in another's place. Perinat (1995) proposes that adopting an intersubjective perspective underpins a cognitive process of "semiotic recursion" in which the communicator makes "jumps" or moves through "inlaid loops" of intersubjective representations in a discursive sequence. Previous semiotic analysis studies (Correa and Orozco 2003; Otero and Correa 2013) have shown that, during the construction of a narrative text, such recursive cognitive processes are fleshed out in the use of discursive strategies, so that cognitive recursion might be reflected in the discursive sequence. Procedurally, it has been proposed that such discourse elements include the use of *polyphony*, construction of *narrative threads*, *cognitive distancing*, and tracing types of descriptions of the *characters' intentions and mental states* (Correa and Orozco 2003; Moreno 2013; Otero and Correa 2013; Perinat 1995).

So far, we argued that the writing process involves the author putting himself "in the reader's shoes" to assess what they may or may not already know about the contents of communication. This, in turn, involves that the author selects the appropriate words and utterances to maximize the reader's comprehension. Thus, the process of grammatical and lexical construction also depends on the writer's understanding of the reader's perspective and knowledge. If the construction of intersubjectivity in narratives influences the lexical and grammatical choices, then, in addition to be reflected in the use of semiotic elements, intersubjectivity construction might be reflected in the presence of lexico-grammatical features.

To sum up, first, we assume that the process of perspective-taking is necessary for intersubjectivity construction and that it involves recursive and reflective processes that should be reflected in the forms that language takes. Second, these language forms may encompass not only discursive strategies but also certain lexical-grammatical choices. If this were the case, a relationship between discourse markers of intersubjectivity and grammatical forms should be observed in narrative texts. This is the hypothesis of this study. Along these lines, the goal of the present study is to explore whether grammatical and lexical elements in narratives are correlated to the use of discursive elements typically associated to intersubjectivity construction in texts.

The current work is unusual from a methodological standpoint. Typically, studies of intersubjectivity construction in text make use of qualitative methods of analysis of semiotic and pragmatic elements (Correa and Orozco 2003; Moreno 2013; Suriani 2006), while numerical measures of lexical and grammatical elements are typically used in quantitative psycholinguistic studies (Aravena 2011; Johansson 2009). There has been, however, little use of mixed approaches that bring both qualitative and quantitative methods to bear in the same

study (cf., Creswell and Clark 2007). Here, we combine semiotic analysis (Moreno 2013; Perinat 1995) aimed at measuring the levels of intersubjectivity construction, with quantitative methods based on frequency counting of occurrences of grammatical and lexical elements. Specifically, the question addressed here is whether the use of semiotic markers of intersubjectivity is associated to the use of lexical or grammatical elements in texts. We hypothesize that if recursive and reflective cognitive processes (such as perspective-taking) are accompanied by embedding and complexity at the lexico-grammatical level, then an increase of grammatical or lexical complexity should co-occur with semiotic markers of intersubjectivity. We explore this question in narratives written by 10- and 11-year-old Colombian children.

Method

Narratives written by 10- to 11-year-old children were analyzed. Mixed methods were used, including quantitative analysis of lexico-grammatical content and semiotic analysis of intersubjectivity construction. This range of age was selected because previous evidence suggests that basic narrative skills reach a stable level of development around the age of 9 (Berman and Slobin 1994). By the time, ten children have been shown to be able to write texts that reflect clear intentional features in their texts, and they show fewer difficulties with the written code. On the other hand, from the age of 12, children go through important changes in the production of narrative texts (Aravena 2011). Then, the age range from 10 to 11 seems suitable for the present study, since children may have achieved stable abilities while still young enough to not experience yet major transitions evidenced at age 12 and on.

Participants

Fifty-five students (27 girls) attending two private schools located in medium socioeconomic neighborhoods in Bogotá, Colombia, participated in the study. Children attended fourth grade of elementary school and were between 10 and 11 years old ($M = 10.13$, $SD = 0.35$).

Procedure

Data was collected at school classrooms. Children were asked to handwrite a two-page essay with a narrative-like structure. The instruction was designed to elicit a canonical narrative structure (Aravena 2011). They were asked to tell a story of a person helping someone else, indicating when and where the events took place and to include an ending. Hand-written texts were transcribed into a digital document by the first author. Texts that did not conform to a narrative structure were not used for analysis. Second, texts that were too short (containing less than 100 words) were also discarded. Finally, 36 (16 written by girls) of a total of 55 collected texts were included in the analysis.

Analysis of Lexical and Grammatical Complexity

The total number of words was counted for each text. Second, texts were segmented into terminal units "T-Units" (Berman and Slobin 1994; Johansson 2009). T-Units are defined as "the shortest units in which it is grammatically permissible to rate as sentences" (Hunt 1970, p. 4) and are constituted by the main clause its subordinated clauses—a clause defined as any unit

containing a unified predicate, be it a verb or adjective (Berman and Slobin 1994). Main clauses and subordinate clauses were identified within each T-Unit.

We used the following measures of syntactic complexity (Chaparro-Moreno et al. 2017; Johansson 2009; Véliz 1988): (1) ratio of total clauses per T-Unit (C/TU), (2) number of words per T-Unit (W/TU), and (3) ratio of subordinate clauses per T-Unit (SC/TU). The latter constitutes a measure of the degree of syntactic incrustation or embedment (Hunt 1970). To estimate the lexical richness of the texts, two measures were taken: (1) lexical diversity and (2) lexical density (Daller et al. 2003; Gregori-Signesa and Clavel-Arroitiab 2015). Lexical diversity is the ratio between word types and total number of word tokens, and it constitutes a measure of richness of vocabulary. Lexical density measures the amount of information in the text, and it is calculated as the ratio between content words (verbs, nouns, adjectives, and adverbs) and total words (Johansson 2009; Wolfe-Quintero et al. 1998). To ensure reliability, measures were coded independently by the two authors of this paper. Cases in which disagreement was found (less than 20% of the total) were resolved by consensus.

Analysis of Intersubjectivity

Following previous work (Moreno 2013; Perinat 1995), the following categories were used as markers of intersubjectivity: (1) *Cognitive distancing*. This measure accounts for the writer's cognitive distancing from the story itself. It is measured by analyzing the way the narrator alludes to space, time, and the characters in the story; (2) *Use of polyphonic voice*. This marker accounts for intersubjectivity since it constitutes a measure of how the narrator quotes different voices in his own discourse; (3) *Construction of the narrative thread*. The texts have or have not a structure that maintains a common thread, from the beginning to the end, constitute a sign of the narrator's concern for intrinsic logic and reader's understanding; and (4) *Description of characters' intentions*. This marker accounts for the consistency of the narrative thread in that it measures how characters' actions are directed to goals. Characters' mental states could or could not be explicitly described. In what follows, we describe the criteria used to code each of these categories in texts.

Narratives were assigned a level between 1 and 5 for each category, and criteria for rating followed closely those previously used by Moreno (2013).

1. *Cognitive distancing*. Three types of textual markers were considered indications of writer's cognitive distancing: (a) references to places, (b) references to time, and (c) description of character's attributes. For each narrative, markers were individually rated on a scale from 1 to 5 according to the following criteria (Moreno 2013): (a) references to places; (b) temporal references; this marker accounts for presence and absence of explicit or implicit references to time and space. Narratives were rated levels 1 to 5 (for place and temporal references, respectively) as described in Table 1; and (c) description of character's attributes. Narratives were rated levels 1 to 5 for character's attributes as described in Table 1. Each narrative was given a global *cognitive distance* score from 1 to 5, as the average of the three subcategory ratings.

2. *Use of polyphonic voice*. Any description of characters' voice or thoughts—either direct or indirect—was considered a use of polyphonic voice, like direct citation (e.g., Juan said: "the Earth span"), indirect citation (e.g., Juan said that the Earth span) or free

Table 1 Cognitive distancing text markers

Level	References to places	References to time	Description of character's attributes
1	Absence of explicit or implicit references	Absence of references	Absence of references to character attributes
2	One implicit reference	One implicit reference	Obscure mentioning of character attributes the writer does not explain who the characters are
3	More than one implicit references	More than one implicit reference	Reference to non-psychological attributes
4	One explicit and any number of implicit references	Any number of explicit references and time described linearly	References to psychological character attributes but no use of pronominal substitution
5	More than one explicit reference	Any number of explicit references, including non-linear descriptions of time trajectories	Mentioning of psychological character attributes and use of pronominal substitution

indirect citation (e.g., the Earth span, Juan said). The criteria used to rate narratives according to use of polyphonic voice followed (Moreno 2013), and it is summarized in Table 2.

3. *Construction of a narrative thread*. This category assesses the writer's success to enunciate of the goal or conflicts around which the story unfolds, as well as the coherence of the story transitions to the logic of the story. Table 3 details the criteria used for following Moreno (2013).

4. *Description of characters' intentions*. Three kinds of text markers that expressed aspects of characters' intentions were identified: (a) references to actions related to characters' intentions; (b) references to emotions related to characters' intentions; and (c) references to mental states related to characters' intentions. Table 4 details the criteria used for text classification following Moreno (2013).

Examples of these text markers in children's narratives are provided in the results section below. Four level scores (one for each category) were summed to produce a global measure of

Table 2 Polyphonic voice text markers

Level	Use of polyphonic voice
1	Absence of polyphonic voice
2	At most two uses of polyphonic voice in relation to a subset of the characters
3	Three or four uses of polyphonic voice in relation to a subset of the characters
4	Five or six uses of polyphonic voice in reference to a subset of the characters
5	Seven or more uses of polyphonic voice in relation to all characters

Table 3 Narrative thread text markers

Level	Construction of a narrative thread
1	No mention to goals or conflicts
2	Goals or conflicts were mentioned, but story transitions were not consistent with them
3	Goals/conflicts were mentioned, but in more than two story transitions were not consistent, the text was coded as level
4	Goals/conflicts were mentioned, but in more than two story transitions were not consistent
5	Goals/conflicts were mentioned, all transitions were consistent, and the ending complied to them

Table 4 Characters' intentions text markers

Level	Description of characters' intentions
1	Absence to references of references to actions, emotions, or mental states related to characters' intentions
2	References only to actions related to characters' intentions
3	References to actions, emotions or mental states related to characters' intentions
4	Two references to actions, emotions, and mental states related to characters' intentions
5	More than two references to actions, emotions, and mental states related to characters' intentions

intersubjectivity, ranging from 4 to 20. The median across narratives were used to split narratives into two groups for analysis (low- and high-intersubjectivity).

Results

Lexico-Grammatical Descriptive Statistics

The mean number of words per text (36 in total) was 211.8 ($SD = 57.91$). The mean number of T-Units per text was 28.36 ($SD = 9.38$). The mean number of clauses per text was 33.97 ($SD = 10.53$), of which 5.72 ($SD = 3.30$) were subordinated clauses and the mean value of C/UT (total clauses per T-Units) was 1.20 ($SD = 0.11$). Table 5 shows the mean value of SC/UT (subordinated clauses per T-Units), the mean of W/TU (words per terminal unit), and the means of lexical diversity (word types/word tokens) per text and lexical density per text (content words/total words). Summarized results in Table 5.

Table 5 Lexico-grammatical descriptive statistics

	Mean	SD
Number of words	211.8	57.91
T-Units	28.36	9.38
Clauses	33.97	10.53
Subordinated clauses	5.72	3.30
C/TU	1.20	0.11
SC/TU	0.21	0.10
W/TU	7.7	1.55
Lexical diversity	0.52	0.08
Lexical density	0.64	0.04

Table 6 Examples of cognitive distance text markers

Examples in narratives		
Space	Implicit reference to places	Un leñador […] se fue a cortar leña cerca de un niño—tr. "A lamberjack […] went to chop wood close to a boy"
	Explicit reference to places	Había una vez […] en una isla mágica, […], había un ave que ayudaba a los demás—tr. "Once upon a time […], on a magical island, there was a bird that helped the others"
Time	Implicit reference to time	[…] después que se curara Miguel se fue con Smithno a su casa para una pijamada. tr. […] "after Miguel was cured, he went with Smithno to his house for a sleepover."
	Explicit reference to time in a linear manner	Aslan le respondió […] que lo iban a matar esa noche entonces Peter tuvo mandar la tropa de la guerra a la tarde siguiente [sic]—tr. "Aslan told him that he was going to be killed that night, and then Peter had to send the troops the following afternoon."
	Explicit reference to time in a non-linear manner	Había una vez […] una tigre [sic] que le gustaba pasear por la selva […]que un día vio a un tigre […] finalmente se atrevió y le dijo "hola"[…]y le contó que una noche él estaba caminando y oyó un ruido […]—tr. "Once upon a time, […] a tigress, who enjoyed walking around the jungle, one day (time in which the story takes places) she saw a tiger [..], finally she dared to say "hello" […], and he told her that one night (time before the story takes place) he was walking and heard a noise […]"
Character	Non-psychological character's attribute	Había una vez una niña […]que era […] muy bonita—tr. "Once upon a time there was a girl […] who was very pretty."
	Psychological character's attribute	[Estaban] Toy Freddy, Toy Bonnie y Toy chica, que cada noche les gustaba asustar al guardia.—tr. "[There was] Toy Freddy, Toy Bonny and small Toy, who every night enjoyed scaring the guard."

Intersubjectivity

Cognitive Distancing

From a total of 36 narratives, one was classified as level 1, 12 were classified as level 2, ten were classified as level 3, ten as level 4, and three as level 5, following the criteria explained above.

References to Places Four narratives presented no references, five narratives presented one implicit reference, 11 narratives presented more than one implicit references, four presented one explicit reference to places, and 12 presented more than one explicit reference to places.

References to Time Two narratives presented no references, 11 presented one implicit reference, nine presented more than one implicit reference, 10 presented explicit references to time described in a linear manner (see Table 6), and four presented explicit references to time including non-linear description

Character's Attributes Four narratives included no references, 12 narratives included obscure references (that is, the characters could not be identified), 11 narratives included non-psychological character's attributes only, and nine included at least one psychological character's attribute (see Table 6).

Use of Polyphonic Voice

A total of 14 narratives presented no use of polyphonic voice (level 1); nine narratives presented minimal use (level 2); nine narratives presented moderated use (level 3); four narratives presented frequent use (level 4). Table 7 illustrates these results. The following are examples of direct (a) and indirect (b) uses of polyphonic voice taken from children's narratives:

a. *El padre le dijo a Jacobo—Te tengo que decir algo hijo …*—tr. "His father told Jacobo—Son, I have to tell you something …"
b. *El otro niño le pidió que si le ayudaba*—tr. "The other boy asked him if he could help him."

Construction of Narrative Thread

A total of 13 narratives contained no mentions to story goals or conflict; seven narratives included enunciation of goal or conflict, but transitions were not consistent to them; five narratives not only included enunciation of goal or conflict and some consistent transitions but also contained inconsistent story transitions; four narratives contained enunciation of goal/conflicts and all were transitions consistent, and seven narratives mentioned goals or conflicts; all story transitions were consistent and included a consistent ending. Table 7 illustrates these results. The following are examples of enunciation of main goal/conflict (a) and consistent story transitions (b):

a. *Esta historia comenzó el 31 de octubre de 1781 […] estaban haciendo los preparativos para Halloween, entonces cuando terminaron un niño llamado Olas que siempre que tocaba algo lo estropeaba, <u>entonces no lo dejaron ir a la fiesta, entonces él se preguntaba ¿por qué no me dejan entrar?</u>*

   tr. This story took place on 31 of October of 1781, […] there were doing preparations for Halloween, then, a boy named Olas, who every time he touched anything, he broke it, <u>was not allowed to go to the party, and then he asked himself ¿why I am not allowed to go?</u> (the story unfolds around this question))

Table 7 Number of narratives by level of polyphonic, narrative thread, and characters' intentions

Level	Use of polyphonic voice	Narrative thread	Characters' intentions.
1	14	13	13
2	9	7	5
3	9	5	10
4	4	4	4
5		7	4

b. *Un leñador[..] estaba cortando para vender su leña para la familia entonces [...] se le*
    cayó el hacha al río y dijo ahora qué voy a hacer [...] no tengo plata para comprar otra
    hacha. [...] de pronto [...] el mago [...] le sacó una [hacha] de hierro y le dijo que sí era
    esa y entonces el mago le dio su hacha y le dijo por decir la verdad entonces te voy a dar
    las dos hachas la de oro y la de bronce [...] para que ayudes a tu familia.

tr. A lumberjack was chopping wood to provide for his family, and then the ax fell into
the river and he said, what am I going to do [...] I have no money to buy another one
(this is then conflict around which the story unfolds) [...] Suddenly, the wizard took out
an iron ax, and the lumberjack said it was his, and the wizard gave him his ax and said
for being honest I will give you two axes, the gold one and the bronze one so you can
help your family (this is an event that resolves the main conflict in the story).

Description of Characters' Intentions

Thirteen narratives presented no references to actions related to character's intentions, nor
references to character's emotions or mental states related to intentions; five narratives
included references to actions related to character's intentions only; ten narratives included
references to actions and either references to mental states or emotions related to intentions;
four narratives included at least one reference to actions, emotions, and mental states related to
character's intentions; and four narratives presented many than one reference to actions,
emotions, and mental states related to character's intentions. Table 7 illustrates these results.
The following are examples (taken from children's narratives) of references to: actions (a),
emotions (b), and mental states (c) related to character's intentions.

a. *Había una vez un niño llamado Pedro, al cual nadie le quería en el colegio [...]. Los*
    papás lo cambiaban de colegio para intentar que se integrara con sus compañeros.

tr. Once upon a time there was a boy named Pedro, who nobody liked at school. His
parents transferred him to another school (action related to intentions) so he could
mingle with his new classmates.

b. *Tres días después encontró a Aslan con sus hermanos y Peter se puso muy feliz.* tr. "Three
    days after he found Aslan with his siblings and Peter turned very happy"
c. *Pedro perdió el interés por ir al colegio, sus padres perdían mucho dinero, sus deudas*
    subieron y sus ventas bajaron. tr. "Pedro lost interest in attending school, his parents were
    losing a lot of money, their debts were rising and their sells were decreasing."

Lexico-Grammatical Measures and Intersubjectivity

Each narrative was assigned an intersubjectivity global score calculated as the sum of individual category scores. Based on the median of global scores (=10), two groups of narratives were constructed: those scoring equal or less than 10 were included in the low-intersubjectivity (LI) group and those scoring more than 10 in the high-intersubjectivity (HI) group. Table 8 shows the mean values of lexico-grammatical measures for each group. LI and HI narratives differed significantly in two measures of grammatical complexity, revealing that HI narratives were more grammatically complex. As shown in Table 8, mean SC/TU in HI ad LI groups were 0.25 ($SD = 0.11$) and 0.17 ($SD = 0.08$), respectively; $p = .02$), and mean C/TU in HI ad LI groups were 1.25 ($SD = 0.12$) and 1.17 ($SD = 0.09$), respectively; $p = .03$).

HI and LI groups, however, did not differ significantly in lexical measures, such as diversity and density, or the total number of words and terminal units. In fact, the number of terminal units in both groups was almost identical (see Table 8). Then, while narratives are comparable in vocabulary, length, and number of utterances, narratives with higher levels of intersubjectivity construction from a semiotic standpoint showed more clausal embedding.

In order to explore whether differences in grammatical complexity were drawn from differences in specific intersubjectivity markers, we compared grammatical measures among four pairs of groups defined at category level. For each category, narratives in levels 5, 4, and 3 were included in the "high-category" group, and those rated level 1 or 2 were included in the "low-category" group.

We found that narratives in high-category groups contained higher CS/UT scores for all categories, but the difference was significant in three of them: *use of polyphonic voice* (mean CS/UT in high and low groups, 0.30 ($SD = 0.09$) and 0.16 ($SD = 0.08$), respectively, $t(34) = 4.48$; $p < 0.05$); *narrative thread* (mean CS/UT in the high and low groups, 0.25 ($SD = 0.18$) and 0.18 ($SD = 0.10$), respectively, $t(34) = 2.0$; $p = 0.05$); and *description of characters' intentions* (mean CS/UT in high and low groups, 0.25 ($SD = 0.11$) and 0.17 ($SD = 0.09$), respectively, $t(34) = 2.11$; $p = 0.04$).

The results provide evidence of a relation between the use of subordinated clauses and intersubjectivity in children's narratives. Conversely, no association was found between intersubjectivity and lexical measures, such as vocabulary (lexical diversity), use of content words (lexical density), or number of terminal units.

Table 8 Lexico-grammatical measures per groups of low and high intersubjectivity

	High intersubjectivity mean (*SD*)	Low intersubjectivity mean (*SD*)	$t(34)$ (*p* value)
Total words	227.5 (60.1)	199.2 (54.3)	1.48 ($p = 0.16$)
T-Units	28.7 (7.8)	28.1 (10.6)	0.22 ($p < 0.5$)
Words/T-Units	8.12 (1.92)	7.36 (1.13)	1.47 ($p = 0.15$)
Clauses/T-Units	1.25 (0.12)	1.17 (0.09)	2.17 ($p = 0.03*$)
Subordinated clauses/T-Units	0.25 (0.11)	0.17 (0.08)	2.32 ($p = 0.02*$)
Lexical diversity	0.53 (0.087)	0.52 (0.079)	0.36 ($p < 0.5$)
Lexical density	0.64 (0.05)	0.64 (0.034)	0.14 ($p < 0.5$)

Note: * .05

Discussion

The goal of this study was to explore the relation between the construction of intersubjectivity and lexico-grammatical aspects in narratives written by 10- and 11-year-old children. The analysis of 36 narratives revealed that texts with different levels of intersubjectivity were comparable in vocabulary, length, and number of utterances. However, higher levels of intersubjectivity were associated to higher grammatical complexity, suggesting a relation between construction of intersubjectivity and clausal incrustation.

It has been argued that intersubjectivity comprises first- and second-person reflective and recursive cognitive processes involved in interpersonal understanding (Rochat et al. 2009). The processes involved in the representation of the communicative situation are, in turn, evident in the discursive sequence (Perinat 1995). Here, we follow previous work, in that we assume that intersubjectivity is reflected in the deployment of discursive strategies, such as the use of polyphony, construction of the narrative thread, cognitive distancing, and descriptions of the characters' intentions and mental states (Correa and Orozco 2003; Moreno 2013; Otero and Correa 2013). Interestingly, our results suggest that the use of these discursive strategies is related to the writer's choice of grammar, specifically the use of subordinated clauses. In other words, the process of taking perspective and engaging in representation of the self and the other's point of view during narrative construction may require frequent use of recursive operations at the grammatical level.

These results suggest interesting parallels between semiotics and grammar use. On the one hand, the construction of intersubjectivity involves reflective and recursive cognitive processes (e.g., Perinat 1995; Rochat et al. 2009): In order to create the intersubjective dimension in a text and to communicate the story thoroughly, the narrator "takes a distance" in order to recognize his own knowledge, the interlocutors' knowledge, and the differences between both. This involves the author to "jump" and "move" between levels of intersubjective representation (Perinat 1995).

On the other hand, at the grammatical level, the capability of incrusting phrases into other phrases is considered a central characteristic of human language. The use of subordinated clauses (or clausal incrustation) typically indicates the expression of underlying grammatical operations that are recursive in nature (e.g., Hauser et al. 2002). Thus, sequential embedding of clauses constitutes a form of complexity inherent to language that, as suggested here, may be paired to intersubjective representation (e.g., results of the relation between SC/T-Units and the intentions and mental states of the characters).

Narrative writing involves the narrator to understand the reader's perspective. Our hypothesis was that underlying processes of intersubjective representation might influence lexical and grammatical choices during narrative construction, such that semiotic markers of intersubjectivity in texts might co-occur with lexico-grammatical features. The results support this idea, suggesting that taking other's perspective and putting on someone's place may encompass certain lexical-grammatical choices when constructing a narrative.

However, how are intersubjectivity and linguistic choices related? The present study is exploratory and makes no claim on the exact nature of the underlying mechanisms that bond together intersubjectivity and the choice of lexico-grammatical elements. However, from a social-constructivist perspective, an observable link between semiotic and grammatical aspects of intersubjectivity is indeed expected. Constructivist theories posit that the child's ability to recognize intentional states of others is pivotal in the process of language development and, in particular, in the process of bootstrapping grammatical structures. Thus, the representation and use of grammatical

forms are not expected to be divorced from the underlying processes of intersubjective representation. Conversely, patterns of production and use of prototypical grammatical forms mediate abstraction and conceptualization during development, playing a key role in establishing the cognitive distance necessary for taking others' perspectives and interpersonal understanding.

To conclude, two contributions are made. First, we found a relation between grammatical complexity—more specifically the use of subordinated clauses—and the construction of intersubjectivity in children's narratives. This relation is very suggestive of the existence of a link between recursive and reflective cognitive processes of semiotic nature, involved in intersubjectivity representation, and the use of grammatical recursion. Second, an original methodological mixed approach was presented, having combined semiotic discourse analysis and quantitative measures of lexical-grammatical elements.

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