Clause packaging in writing and speech:

A cross-linguistic developmental analysis*

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This article analyses clause packaging in the written narrative and expository texts in Dutch, English, French, Hebrew, and Spanish by grade-school children and adults. A "clause package" is defined as a text unit consisting of clauses linked by syntactic, thematic, and discursive criteria. Our study attempts to arrive at an understanding of cross-linguistic universals in the distribution of clause-package types as a function of Genre and Modality in both children and adults. To this end, we distinguish finite vs. nonfinite coordination, subordination, and relativization; we compare their distribution in the five languages; and we examine the semantics of the conjunctions occurring in narrative vs. expository texts. Results show that, in all languages, children tend to use more co-ordinate devices than adults, whereas adults use more adverbial, complement, and relative clauses. A clear interaction was found between Genre and type of clause packaging: For both children and adults, coordination was the preferred device in narrative, whereas subordination occurred more often in the expository texts.

1. Introduction

There is good evidence that major points in development are associated with the appearance or transformation of new forms of communication. A clear example is the transition from utterance to text. Later language development in children can be characterized by a growing command of different types of discourse, particularly in the area of monologic text production of the kind considered here. Developmental shifts take place from intra- to inter-sentential devices, from basic structures to additional functions, from extra- to intra-linguistic abilities, and from contextual to decontextualized abilities.

A major aspect of text production is the packaging of ideas into larger linguistic units. In a piece of discourse, ideas are not simply arranged as a linear chain, but are typically packaged into hierarchical constructions. A "clause package" can be defined as a text unit linked by syntactic, thematic, and discursive criteria (following on the idea of "syntactic packaging" as defined by Berman & Slobin 1994: 538–54). Clause packaging fulfils the role of hierarchically encoding temporal, causal, and motivational connections in the text. Such connectivity can be expressed by means of clause-linking devices such as syntactic conjunction, subordination, relative clauses, nonfinite verb forms, and elliptical constructions.

Different languages use different formal constructions to express connections in the text. From a comparative viewpoint, two types of complex sentence structures can be distinguished: CO-RANKING and CHAINING (Longacre 1985). Co-ranking structures, such as those found in most Indo-European languages, may consist of several verbs of the same rank. A chaining structure, by contrast, typically ends in a dominating verb of a fuller structure than any of those preceding. Traditionally, in languages not entirely of the chaining variety, a distinction is made between co-ordinate and subordinate linkage relations. Co-ordinate clauses are autonomous, and are added together with or without co-ordinating conjunctions. In subordinate constructions, one of the clauses (the main clause) is modified by one or more subordinate clauses. Subordinate clauses are grammatically dependent on the main clause and are usually introduced by a subordinating conjunction. They may also function as modifiers of nouns, in which case they are relative clauses.

Different genres make their own demands as regards the ordering of thematic materials. The question is to what extent the linguistic marking of cohesion on the micro-level of individual clauses and adjacent clauses will differ across the two types of texts. It can be hypothesized that the temporal anchoring of narratives will result in a higher proportion of temporal connectivity markers, as compared to expositories (cf. Garnham & Oakhill 1992, Costermans & Fayol 1997). But narratives have not only temporal structuring; they are also causally structured in terms of a hierarchically organized goal plan of action (cf. Trabasso & van den Broek 1985, Trabasso & Rodkin 1994). We start from an overall action-structure; then factors of importance, thematic coherence, and evaluative comments are integrated into the causal structure of an initial goal, into attempts to reach this goal, and into the final outcome of these attempts.

The causal connections in a narrative can be manifold. Events can cause other events, or they can psychologically cause internal responses or goals. Internal responses may cause other internal responses or goals. Outcomes can cause other outcomes, or internal responses and goals. Graesser et al. 1994 have shown that connectives play an important role in constructing inferences during narrative text construction. Similar findings emerge from research on the production of expository texts. In expository discourse, adjacent propositions are tied together to causally connect underlying semantic relations (Britton 1994). The ideas expressed in one sentence are tied to those expressed in neighboring sentences through explicit and implicit connection devices. Studies by Bestgen & Vonk 1995, Miller et al. 1993, and Sanders & Noordman 2000 provide empirical support for the position that connectives play a facilitating role in the (re)construction of expository texts.

Cognitive and linguistic factors interact in the development of clause packaging. From a cognitive point of view, children have a limited range of encodable perspectives at their disposal. Moreover, they cannot fully assess the viewpoint of the listener. From a linguistic point of view, there is independent evidence that the range of linguistic means to express ideas is restricted. Berman & Slobin 1994 have made clear how the packaging of information in narratives changes as language development evolves. Young children start out with a sequence of clauses whose temporal order is more or less iconic with the order of narrated events. A growing understanding of the temporal, causal, and motivational texture of events motivates the child to develop complex syntax in order to be able to construct higher-order events. From a syntactic viewpoint, the acquisition of clause packaging involves insight into the layered structure of the clause and the concepts of embeddedness and dependence. Since children start out linking clauses before they completely master or understand a full range of temporal and causal operators in their language, it can be expected that the linkage of subclausal units will precede the linkage of full clauses. There is also evidence that the linkage of autonomous clauses is conceptually simpler than the linkage of clauses embedded within one another (Nippold 1998).

Learning the distinctions between different genres of text across modalities is a major aspect of later language development — even though, in most school systems, the teaching of genre in writing remains highly implicit (Kress 1994). While sentences express ideas and perceptions, texts have the function of ordering such ideas and perceptions into larger wholes. A related turning point in children's development is the transition from oral to written language. Learning to read and write involves much more than the ability to decode print to speech, and to encode speech in print. Registers of written language require a different selection and organization of ideas than those of oral language. In written communication, logical and ideational functions are primary. Oral communication is less abstract, since the listener has access to a wide range of contextual cues, of a kind that are almost completely absent in written communication. This, in turn, yields a distinction between context-embedded communication and context-reduced communication. For children, the transition from oral to written language can be thought of as a critical event, involving the learning of a new syntax. In learning to write, the child learns how to deal with larger text structures and with the sentence as a new syntactic unit. For a unit of text to be considered a "sentence," it must meet the two demands: that of internal integration, and that of a specific structure in the larger text. Hunt 1970 introduced a measure called a MINIMAL TERMINAL UNIT or T-UNIT, which he defined as one main clause plus any subordinate clause (or nonclausal structure) that is attached to it or embedded in it. In an empirical study, Hunt found that children's early writing is characterized by the almost exclusive use of co-ordinated main clauses. Subordinating constructions appeared only towards the end of grade school.

Moreover, studies of syntactic development have documented gradual improvement in children's knowledge and use of co-ordinating and subordinating conjunctions. Flores d'Arcais 1978 showed, in a series of experiments among school-age children, that a full understanding of conjunctions is only acquired beyond age 12. McClure & Steffensen 1985, studying the ability of grade-school children and adolescents to use conjunctions in a sentence completion task, revealed that performance increased with grade level, and that subordinating devices were more difficult than co-ordinating devices. They also found that students' use of conjunctions was related to their literacy level. Various studies have shown that school-age children and adolescents show an increasing competence in using more complex sentences in the course of text production (e.g. Loban 1976, Morris & Crump 1982, Savage & Fallis 1988, Scott 1988).

Previous work on the use of conjunctions in narratives has concerned oral narratives, typically ones in which subjects told a story on the basis of pictures. Berman 1998 explores the development of form/function relations in the use of English AND in oral narratives. Comparing this with data from French (Jisa 1985, 1987) and Hebrew (Berman 1996), she concludes that preschool children tend to use *and* as an interactive device, indicating that more is to come. With progression of age, its function moves towards clause-initial chaining and text-embedded chunking. Peterson 1986 examines the semantic and pragmatic use

of the conjunction *but* in children ranging from 3;6 to 9;6 years. Silva (1991) studies the use of co-temporal connectives — in particular *when, while,* and *as* — in children ranging from 4;1 to 11;11, and in adults. Laubnitz (1987) makes an inventory of the conjunctions used by children ranging from 2;0 to 4;0. In these studies, all on English — speaking children, conjunctions increased in frequency as a function of age. Similar conclusions have been reached in studies examining clause packaging in story retelling. Chapell (1980) and Savage & Fallis (1988) conclude that both the frequency and variety of co-ordinating and subordinating devices increase with progression of age. Several other studies show that syntactic complexity in clause packaging varies in relation to discourse mode. Leadholm & Miller (1992) find not only that the complexity of clause packages increases with age in conversation and narration in children from 3 to 13 years, but also that children produce more elaborated packages in the narrative than in the conversational mode.

Several researchers have examined the production of written text. Crowhurst & Piche (1979) — studying 11- and 15-year-old students assigned to write texts in narrative, expository, and argumentative genres — show that, at both age levels, the clause packages are most complex in the argumentative texts, followed by the expository texts, and then by the narratives. The clause packaging in the argumentative and expository texts also turned out to be most affected by developmental growth. A replication study by Crowhurst 1980, on narrative and argumentative texts in 12-, 14-, and 16-year-old students, points in the same direction. To the best of our knowledge, the present study is the first attempt to examine the development of clause packaging across genres and modalities from a cross-linguistic point of view.

In the present study, use of clause packaging in children's and adults' writing is examined in spoken and written narrative and expository text in Dutch, English, French, Spanish, and Hebrew. Analysis builds on preliminary studies by Aparici et al. 2000, Cahana-Amitay & Sandbank 2000, Kriz et al. 2000, Van Hell et al. 2000, and Verhoeven & Van Hell 2000. Groups of 10-year-old children and young adults, all from middle-class backgrounds, told and wrote narrative and expository texts after seeing the same video film as a shared trigger. Data analysis focuses on the distribution of clause-linking devices as a function of Genre and Age, based on an analysis of how clause-linking devices constitute minimal terminal units (T-units) in the text. Both the use of clause-linking devices and the number of clauses per T-unit are analysed in relation to Age, comparing children with adults, in order to address the following research questions:

i. What is the distribution of clause packages in narrative and expository texts, spoken compared with written, among children compared with adults?
ii. What types of co-ordinating and subordinating conjunctions are used by children and adults?

With respect to question (i), we expected that the adult texts would show more hierarchical organization of text than the children's, in both the narrative and expository genres, and that there would be an interaction with Modality, showing greater differences in written than in spoken texts. We expected that some school-age children would show considerable skill in clause packaging, but that dense hierarchical layering of information in syntactically packaged constructions would be confined to adult texts. As regards question (ii), we expected a gradient between children and adults in the use of co-ordinating vs. subordinating devices, showing a transition from series of clauses of the same rank to packages of clauses of increasing syntactic dependence. We expected that not only the extent, but also the variety of such clause packaging would be greater in adults. As regards cross-linguistic variation, we expected to find similar trends across the five languages under study here, given that the clause-packaging devices in these languages are highly comparable.

2. Clause packaging in five languages

Dutch, English, French, Spanish, and Hebrew are all right-branching languages, stacking additional information across clauses (cf. Van Valin 1993), with a single favored ordering of clauses across different types of texts. Overt markers of clause linkage or syntactic connectivity — such as co-ordinating conjunctions, markers of sequentiality, or markers of temporal and causal contingencies — are typically clause-initial.

The languages under consideration here show a familiar array of co-ranking structures (Berman & Slobin 1994, Berman 1998). Co-ordinating and subordinating conjunctions predominantly combine finite clauses, with full verb-marking for person/number and tense/aspect. Co-ordinating conjunctions link syntactically similar, autonomous clauses. Subordinating conjunctions link two syntactically distinct clauses, typically a main clause and a subordinate clause. In subordinate constructions, a main clause is modified by a subordinate clause, which is grammatically dependent on the main clause. For the present analysis we distinguish the following types of co-ordinating conjunctions:

(1) Additive co-ordination ('and')
  a. Dutch: *De jongen kwam binnen <u>en</u> hij begon te schreeuwen.*
  b. English: *The boy came in <u>and</u> he started to cry.*
  c. French: *Le garçon entrait <u>et</u> il commencait à pleurer.*
  d. Hebrew: *Ha-yeled nixnas <u>ve</u>-hu hitxil livkot.*
  e. Spanish: *El chico entró <u>y</u> empezó a llorar.*

(2) Adversative co-ordination ('but')
  a. Dutch: *Het gebeurde, <u>maar</u> we konden er niets aan doen.*
  b. English: *It happened, <u>but</u> we couldn't do anything about it.*
  c. French: *C'est arrivé <u>mais</u> nous n'avons rien pu faire contre cela.*
  d. Hebrew: *Ze kara <u>aval</u> loh yaxolnu la'asot shum davar ba-inyan.*
  e. Spanish: *Pasó <u>pero</u> no pudimos hacer nada.*

(3) Consecutive coordination ('so')
  a. Dutch: *Onze leraar had ons gezien; <u>dus</u> stopten we ermee.*
  b. English: *Our teacher had seen us, <u>so</u> we stopped it.*
  c. French: *Notre professeur nous a vu <u>donc</u> nous avons arrêté.*
  d. Hebrew: *Ha-mora shelanu ra'ata otanu; <u>az</u> hifsaknu et ze.*
  e. Spanish: *Nuestro profesor nos había visto, <u>por eso</u> paramos.*

With regard to subordinating conjunctions, we distinguish the following types:

(4) Complementation ('that')
  a. Dutch: *Ik denk <u>dat</u> de trein later aankomt.*
  b. English: *I think (<u>that</u>) the train will arrive later.* [optional in English]
  c. French: *Je pense <u>que</u> le train arrivera plus tard.*
  d. Hebrew: *Ani xoshev <u>she</u> ha-rakevet tagia meuxar yoter.*
  e. Spanish : *Creo <u>que</u> el tren llegará más tarde.*

(5) Temporal subordination ('after', 'before', 'since', 'until', 'when', 'while')
  a. Dutch: *<u>Nadat</u> hij gegeten had viel hij in slaap.*
  b. English: *<u>After</u> he had eaten, he fell asleep;*
  <u>After</u> eating, he fell asleep.
  c. French: *<u>Après</u> avoir mangé, il s'endormit.*
  d. Hebrew: *<u>Axarey she</u> hu axal hu nirdam.*
  e. Spanish: *<u>Después de</u> comer se durmió;*
  <u>Después de que</u> hubiera comido se durmió.

(6) Causal subordination ('because', 'since', 'as')
  a. Dutch: *<u>Omdat</u> hij honger had heeft hij veel gegeten.*
  b. English: *<u>Because</u> he was hungry, he ate a lot.*
  c. French: *<u>Comme</u> il avait faim, il a beaucoup mangé.*

d. Hebrew: *Biglal she haya raev hu axal hamon.*
e. Spanish: *Porque tenía hambre ha comido mucho.*

(7) Consecutive subordination ('so that')
a. Dutch: *Het werd laat zodat zij ongerust werd.*
b. English: *It was getting late so that she became anxious.*
c. French: *Il commençait à se faire tard c'est pourquoi elle devenait anxieuse.*
d. Hebrew: *Nihiya meuxar kax she-hi nihiyta xareda.*
e. Spanish: *Se estaba haciendo tarde de modo que se puso nerviosa.*

(8) Subordinations expressing a purpose or a goal ('in order to', 'so as to')
a. Dutch: *Om op tijd aanwezig te zijn ging hij vroeg weg.*
b. English: *In order to be there on time, he left early.*
c. French: *Pour être à l'heure il est parti tôt.*
d. Hebrew: *Kedey lihyot ba-zman, hu azav mukdam.* [nonfinite]
Kedey she-yihiye ba-zman hu azav mukdam. [finite]
e. Spanish: *Para (poder) presentarse a tiempo salió temprano.*

(9) Subordinations expressing an assumption or condition ('if')
a. Dutch: *Als het regent wordt de wedstrijd afgelast.*
b. English : *If it is raining, the match will be canceled.*
c. French: *S'il pleut, le match sera annulé.*
d. Hebrew: *Im yered geshem, ha-misxak yitbatel.*
e. Spanish: *Si llueve el partido será cancelado.*

(10) Concessive subordination ('although')
a. Dutch: *Hoewel hij honger had heeft hij niet veel gegeten.*
b. English: *Although he was hungry he didn't eat much.*
c. French: *Il n'a pas beaucoup mangé même s'il avait faim.*
d. Hebrew: *Lamrot she-haya raev, hu loh axal harbe.*
e. Spanish: *Aunque tenía hambre, no ha comido mucho.*

(11) Conjunctions expressing a comparison ('as if')
a. Dutch: *Hij loopt alsof hij de koning is.*
b. English: *He walks as though he were the king.*
c. French: *Il agit comme s'il était le roi.*
d. Hebrew: *Hu mitnaheg keilu she-haya ha-melex.*
e. Spanish: *Camina como si fuera el rey.*

Relative clauses can be seen as subordinating structures which function as modifiers of nouns. In all the languages under consideration, these are right-branching; i.e., they are placed after the head. In Dutch, English, French, and

Spanish, pronouns are used to relativize a noun phrase. Hebrew does not have relative pronouns. Examples of relative clauses in which the head noun is the subject, in both the main clause and the relativized clause, are given below.

(12) Relative clause with head noun as subject in main and relativized clause.
a. Dutch: *De jongen die naast mij zat begon te huilen.*
b. English: *The boy who sat next to me began to cry.*
c. French: *Le garçon qui s'assieds à côté de moi commençait à pleurer.*
d. Hebrew: *Ha-yeled she-yashav leyadi hitxil livkot.*
e. Spanish: *El chico que se sentó a mi lado empezó a llorar.*

3. Design of the present study

3.1 Subjects

Eighty grade-school children aged 9–10 years and 80 university graduate adults took part in the present study. Table 1 presents the distribution of subjects in the two age-groups as a function of Language.

Table 1. Distribution of subjects

	Dutch	English	French	Spanish	Hebrew
Children	20	20	20	10	10
Adults	20	20	20	10	10

3.2 Data analysis

Narrative and expository texts, spoken and written, were analysed as follows. The total number of words per text was computed as a measure of text length. To measure syntactic complexity, the mean clause length (in number of words) was measured, as well as the mean number of clauses per T-unit. (A T-unit was defined as one main clause plus any subordinate clause attached to it, or embedded in it.) Here we are concerned with the syntactically motivated way in which subjects link parts of their texts to construct a hierarchical organization. Such connections minimally occur between one predicating clause and another, but they can also be manifested across extended chunks of discourse. The combination of clauses into one syntactically packaged construction is also an object of study. To evaluate such nesting of clauses, we computed tokens for types of T-units differing in the number of clauses that were syntactically organized in a single unit. Distinctions was made among T-units varying from 2 to 9 clauses.

We segmented the texts into packages defined in syntactic terms, regardless of the discourse functions of the various means of clause combining. A distinction was made between the following types of packages:

a. Finite linking of clauses: Clauses linked by a co-ordinating or subordinating conjunction, with a finite verb in the co-ordinate or subordinate clause. Analysis was confined to conjunctions that were used clausally, i.e. those that connect full clauses (excluding conjunctions used phrasally) to connect individual words or phrases.
b. Nonfinite linking of clauses: gerundive and infinitival constructions.
c. Relative clauses modifying nouns: finite and nonfinite relative clauses.

We also counted the various types of co-ordinating and subordinating devices as a function of text length. In co-ordinate constructions, we counted the numbers of co-ordinate, adversative, causal, and consecutive conjunctions. In subordinate constructions, we counted occurrences of markers of complement clauses ('*that* complements') and of adverbial clauses — divided into temporal, causal, consecutive, purpose-oriented, conditional, concessive, and comparative conjunctions.

4. Results

4.1 T-units

In Table 2 we present the means and standard deviations of the mean lengths of T-units, defined by number of clauses per T-unit, in the texts produced by children and adults across the five languages in our sample. In Figure 1 the mean T-units are presented as a function of Age and Language.

Across the five languages, there are substantial differences between children and adults. Moreover, the Dutch and Hebrew samples show somewhat lower scores than the other languages. Analysis of variance showed the factors of Age ($F(1,152) = 33.69$, $p<.001$) and Language ($F(4,152) = 18.84$, $p<.001$) to be significant. The Age × Language interaction was not significant.

Adults produce significantly longer sequences of event packaging than grade-school children. This difference reflects mature use of extended clause

Table 2. Means and standard deviations of number of clauses per T-unit in four types of texts (narrative and expository, written and spoken) of grade-school children and adults, by Language

	Children		Adults	
	Mean	Sd	Mean	Sd
Dutch	1.35	.23	1.80	.34
English	1.80	.36	2.30	.32
French	1.71	.27	2.04	.33
Hebrew	1.50	.38	1.84	.22
Spanish	1.61	.39	2.19	.47

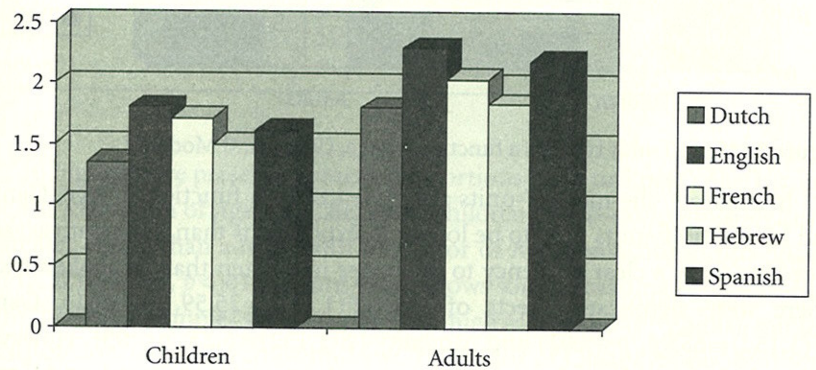

Figure 1. Mean T-units as a function of Age and Language

packages, which tend to be highly cohesive in both syntactic organization and thematic unity. The excerpt in ex. 13, from the written expository text of an English-speaking university graduate student, is an example of a highly dense layering of information in a single thematic unit, with no fewer than seven clauses combined into one syntactically packaged construction.

(13) *I believe that*
if an evolutionist and a creationist for instance engage in heated discussion
and both present their viewpoints efficiently
and both gain an understanding of the other's view
and realize
that their questions will probably never be answered
no conflict has taken place.

In Figure 2 we present the mean proportions of T-unit types as a function of Age. The differences between the two distributions turned out to be significant ($F(5,152) = 13.04$, $p<.01$).

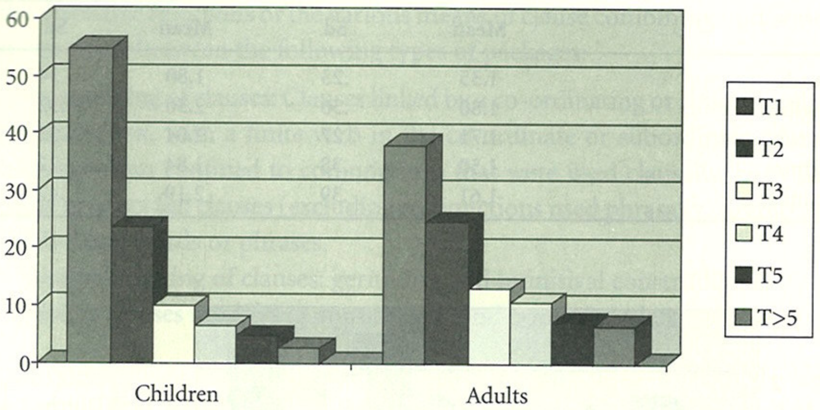

Figure 2. Mean T-unit types as a function of Age, Genre, and Modality

In Figure 3, the mean T-units are presented as a function of Age, Genre, and Modality. T-units tend to be longer in expositions than in narratives, and they also show a clear tendency to be longer in written than in spoken texts. There were significant effects of Age ($F(1,152) = 25{,}59$, $p<.001$), Genre ($F(1,152) = 63.94$, $p<.001$) and Modality ($F(1,152) = 5.83$, $p<.05$). However, there was no significant interaction between Age, on the one hand, and Genre or Modality, on the other; this suggests that Genre and Modality effects are equally strong for children and adults.

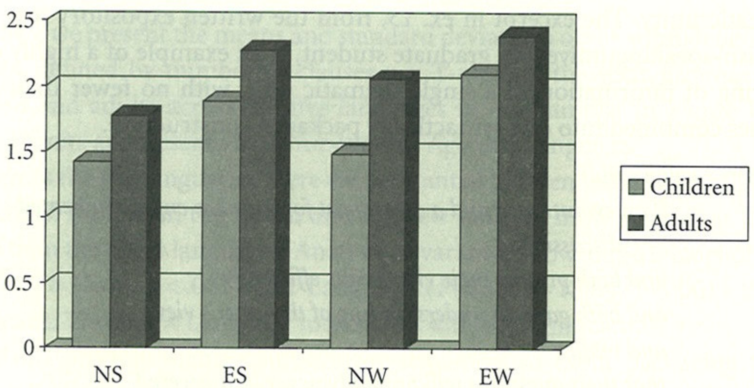

Figure 3. Mean proportion of T-units types as a function of Age and Language

4.2 Co-ordinating devices

In Table 3, we present the percentages of co-ordinating devices used by children and adults across our sample.

Table 3. Means and standard deviations of percentages of coordinations in four types of texts (narrative and expository, written and spoken) of grade-school children and adults, by Language

	Children		Adults	
	Mean	Sd	Mean	Sd
Dutch	29.73	17.46	19.43	6.89
English	17.14	12.63	12.24	6.98
French	18.89	14.12	15.53	9.93
Hebrew	25.20	16.81	16.38	9.83
Spanish	25.81	9.67	17.69	6.22

In Figure 4, we present the mean proportions of co-ordinate constructions used as a function of Age and Language. Children use co-ordinating devices to a greater extent than adults, with the factor of Age significant in this respect ($F(1,152) = 10.87$, $p<.01$). Figure 4 also shows some cross-linguistic variation, with the Dutch samples showing relatively high scores and the English samples relatively low scores on co-ordination. The factor of Language was significant ($F(4,152) = 11.43$, $p<.01$).

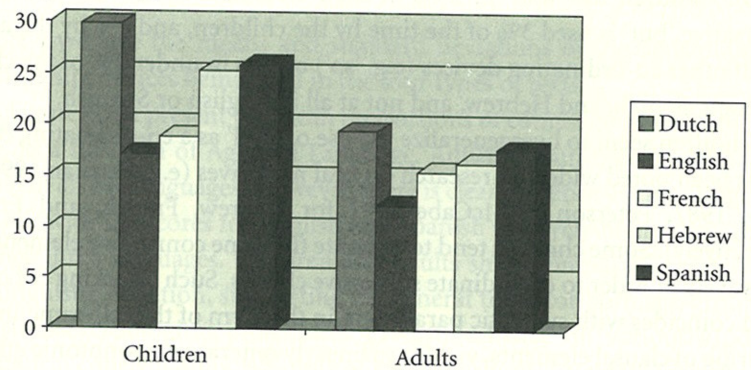

Figure 4. Mean proportion of coordinations as a function of Age and Language

In Figure 5, we present the mean proportions of co-ordination as a function of Age, Genre, and Modality. The data show that, in both children and adults, the proportion of co-ordinations is higher in narratives than in expositions. Analysis of variance showed a significant effect of Age ($F(1,152)=9{,}83$, $p<.01$), Genre ($F(1,152)=23.91$, $p<.001$), and Modality ($F(1,152)=11.68$, $p<.01$). The Genre × Age interaction was also significant ($F(1,152)=5.29$, $p<.05$), and can be explained by the fact that the grade-school children make very wide use of co-ordination in their written narratives.

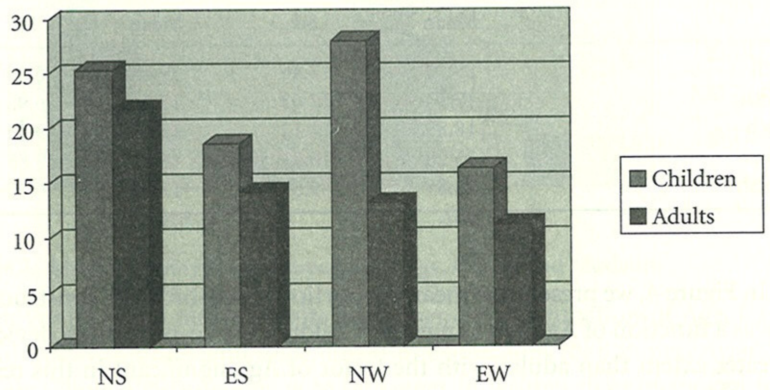

Figure 5. Proportion of coordinations as a function of Age, Genre, and Modality

Additive co-ordination turns out to be the most frequent co-ordinating device: Children use 'and' in 20% of their clauses, and adults in 11%. The adversative 'but' is used 3% of the time by the children, and 7% by the adults. Use of other co-ordinating devices (e.g. 'so') occurs in under 2% of the clauses in Dutch, French, and Hebrew, and not at all in English or Spanish.

Children seem to overgeneralize the use of 'and' as a co-ordinating device, as has been noted widely in research on oral narratives (e.g. Berman 1996, Jisa 1985, 1987, Peterson & McCabe 1991 for Hebrew, French, and English, respectively). Some children tend to reiterate the same connective element 'and' excessively in order to co-ordinate successive clauses. Such "stacking" of clauses often coincides with syntactic parallelism in the form of the self-same internal ordering of clausal elements, yielding a linearly reiterative, monotonic effect, as in this example from a written narrative text of a Dutch-speaking 9-year-old boy:

(14)	*en toen ging ik die jongen duwen*	'and then I started to push that boy'
	en hij ging mij duwen	'and he started to push me'
	en toen begon hij te schelden	'and then he began to call me names'
	en toen ging ik ook schelden	'and then I started to call him names too'
	en toen zei het tegen zijn moeder	'and then he told it to his mother'
	en dat is natuurlijk flauw.	'and that is of course silly.'

In all languages under consideration, some children use direct speech or interactive and other types of discourse markers, such as 'I think' or 'Look', as devices to alternate such monotonous sequences.

The use of 'and' as a co-ordinating device also serves for syntactic conjoining of clauses with shared subjects in the four languages of our sample which, do not grammatically require elision of the repeated subject in co-ordinate clauses. Children sometimes deleted coreferential subjects in the second clause, as in the Dutch example in ex. 3 from the written narrative of a 10-year-old Dutch-speaking girl. However, in the Dutch sample, subject ellipsis occurred in less than 5% of the clauses, for both children and adults.

(15)	*kinderen gaan elkaar duwen*	'children start to push each other'
	en lelijke woorden zeggen	'and say dirty words'
	en elkaar trappen	'and kick each other'
	en houden niet op.	'and don't stop.'

As noted, adults make far less use of 'and', some adults not using this device even once across their four texts.

4.3 Subordinating devices

In Table 4 we give the means and standard deviations of the percentages of subordinating devices being used in the four types of texts.

In Figure 6, we present the mean proportions of complement and adverbial clauses as a function of Age and Language. Adults obtain higher scores than children in all five languages. However, there is clear evidence of cross-linguistic variation, with the scores for English and Spanish relatively high compared to the other three languages. Children and adults show comparable patterns of cross-linguistic variation, supporting the general trend for both age-groups to show similar typological preferences in their reliance on various kinds of grammatical constructions. Analysis of variance showed a significant effect of Age ($F(1,152)=9{,}71$, $p<.01$) and Language ($F(4,152)=10.30$, $p<.01$). The Age × Language interaction was not significant.

In Figure 7, we present the mean proportions of complement and adverbial clauses as a function of Age, Genre, and Modality. Use of these subordinating

Table 4. Means and standard deviations of percentages of subordinations in four types of texts (narrative and expository, written and spoken) of grade-school children and adults, by Language

	Children		Adults	
	Mean	Sd	Mean	Sd
Dutch	12.74	9.53	21.05	8.86
English	19.81	12.43	27.83	7.61
French	17.28	11.81	20.74	7.18
Hebrew	13.54	10.93	17.06	6.59
Spanish	24.32	14.86	28.37	8.24

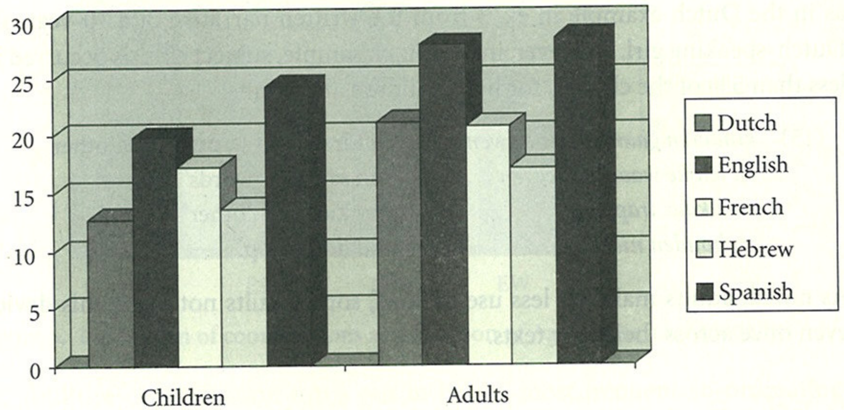

Figure 6. Mean proportion of subordinations as a function of Age and Language

devices is higher in expositions than in narratives, and in the writing than in speech. Children seem to have more difficulty in using subordinating devices in the written modality. Analysis of variance showed significant effects of Age ($F(1,152)=9{,}92$, $p<.01$), Genre ($F(1,152)=9.19$, $p<.01$), and Modality ($F(1,152)=8.33$, $p<.05$). There was also a tendency for the Age × Modality interaction to be significant ($p<.10$).

In Figure 8, we present the distribution of different types of complement and adverbial markers, as used by adults across the five languages, in narrative vs. expository texts. At first glance, there is little difference between the two genres: Complements introduced by 'that' are by far the most common, followed by temporal and causal adverbial conjunctions — with conditionals occurring slightly more often in expository texts. However, some striking differences also occur. In the narratives, we see more temporal markers than in the expositions,

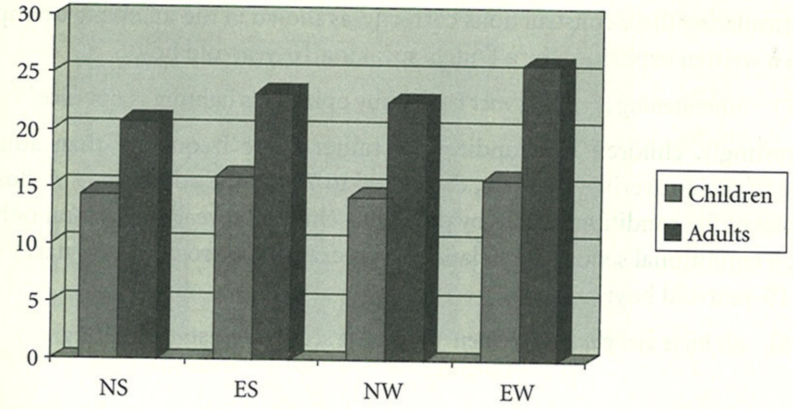

Figure 7. Proportion of subordinations as a function of Age, Genre, and Modality

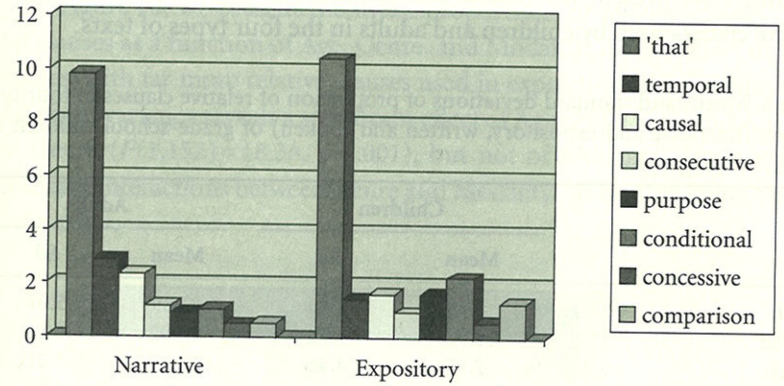

Figure 8. Mean proportions of subordination type as a function of Genre

whereas the reverse is true for conditionals, purpose clauses, and comparison markers. Analysis of variance showed the difference in distribution of subordinating devices over the two genres to be significant ($F(1,76)=11.92$, $p<.001$).

Children seem to use direct speech as a transitional device to express syntactic dependence. The Dutch children's texts, for example, include many such instances, as in the following excerpt from the written narrative of a 10-year-old Dutch-speaking girl.

(16)	*maar toen zei ik*	'but then I said'
	"ik vind het niet meer leuk."	' "I don't like it any more." '

'That' clauses are also the most frequent subordination device in the children's data (about 40% of the subordinations). However, children often have difficulty in formulating these constructions correctly, as shown in the following example from a written exposition by a Dutch-speaking 10-year-old boy.

(17) *mijn mening is ruzie is niet leuk* 'my opinion is fighting is not nice.'

Interestingly, children use conditionals rather more frequently than adults (17% of their adverbial markers, compared to 7% in the adult data). A closer analysis of the conditionals used by the Dutch children reveals a temporal rather than a conditional sequence of clauses. This example is from an oral narrative of a 10-year-old boy:

(18) *als hij je ziet gaat hij vechten* 'if he sees you he starts fighting'

4.4 Relative clauses

In Table 5 we present the means and standard deviations in percentages of relative clauses used by children and adults in the four types of texts.

Table 5. Means and standard deviations of proportion of relative clauses in four types of texts (narrative and expository, written and spoken) of grade-school children and adults, by Language

	Children		Adults	
	Mean	Sd	Mean	Sd
Dutch	3.48	4.43	7.89	5.87
English	6.70	3.74	14.92	4.11
French	7.95	4.46	13.49	5.21
Hebrew	10.95	6.09	17.01	4.26
Spanish	5.06	6.31	16.66	7.43

In Figure 9, we display the mean proportions of relative clauses out of total clauses for the two age-groups and the five languages in our sample. Across the languages, adults use far more relativization in their texts than children. In cross-linguistic terms, the adult data reveal that Hebrew and Spanish subjects score relatively high (a finding that confirms a similar trend for the spoken "frog story" narratives reported in Berman & Slobin 1994); English and French subjects take an intermediate position, and the Dutch come out relatively low. A similar trend can be observed in the child data, except for the relatively low use of relative clauses among the Spanish children. Analysis of variance showed significant effects of Age ($F(1,152)=51.94$, $p<.001$) and Language ($F(4,152)=$-16.38, $p<.001$), with no significant interaction.

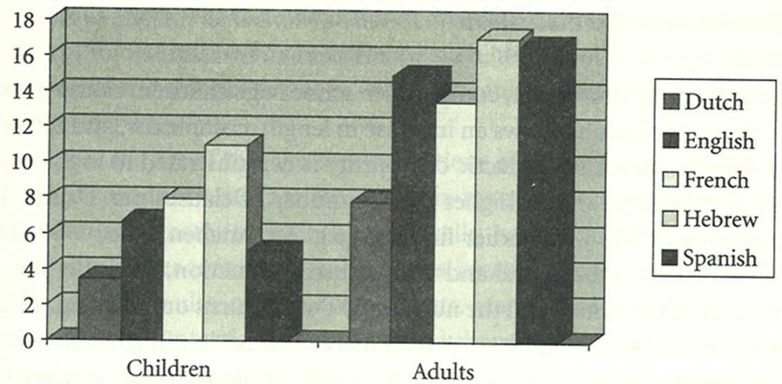

Figure 9. Mean proportions of relative clauses as a function of Age and Language

In Figure 10, we present the mean proportions of relative clauses out of total clauses as a function of Age, Genre, and Modality. A clear effect of Genre emerges, with far more relative clauses used in expositions than in narratives. Analysis of variance reveals a significant effect of Age ($F(1,152)=46.22$, $p<.01$) and Genre ($F(1,152)=18.36$, $p<.001$), but not of Modality. There were no significant interactions between Genre and Modality, on the one hand, and Age on the other.

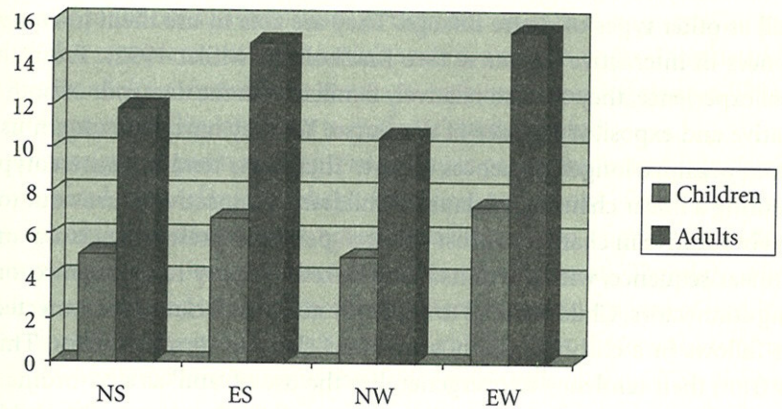

Figure 10. Percentages of relative clauses as a function of Age, Genre, and Modality

5. Conclusions and discussion

The present study shows that, compared to school-age children, clause packaging in the texts of adults shows an increase in length, complexity, and informational density. Increased syntactic complexity is demonstrated in higher mean length of utterance, and in higher mean number of clauses per T-unit. This conclusion is in line with earlier findings (e.g. McCutchen 1986, 1987, Kress 1994). Moreover, in both oral and written text production, the ratio between the number of utterances and the number of T-units turns out to be significantly higher in adults than children. Adults succeed better in piling up connective devices across chunks of clauses, and this results in much longer sequences of event packaging. The result is tightly woven texts, made up of units that are highly cohesive in both syntactic organization and thematic relevance. The analysis of conjunctions points in the same direction. Co-ordination, subordination, and relativization can be seen as devices that enable the language user to condense surface structures into very compact forms. The numbers of co-ordinations in the children's texts are larger than in the texts of the adults. The numbers of subordinating devices used increases in spoken and written texts as a function of Age. The same is true for the use for relative clauses.

The question is why children rely so heavily on co-ordinating conjunctions. They obviously have grammatical command of various forms of subordination, as well as other types of clause linkage. They are able to use them in complex sentences in interactive discourse (see Leadholm & Miller 1992). From their school experience, they are also relatively familiar with the demands of both the narrative and expository modes of discourse. Yet they have difficulty in using them to organize longer sequences of text. Their texts tend to be stereotyped, presenting a linear chaining of clauses. Children's connectivity turns out to be strongly additive in character. Most children persist in presenting clausal units in a linear sequence, with the units being linked by heavy reliance on co-ordinating connectors. Children tend to explicitly mark each clause as connected to what follows in a chronologically sequenced chain of terminal units. This is clear from their tendency to overgeneralize the use of 'and' as a co-ordinating device, reflecting a sense of sequentiality, across all five languages. The children seem to use these overt markers of connectivity for the purpose of chaining clauses within extended discourse. This might serve two purposes: between clauses with shared subjects, as a means of syntactic coordination; and with same or different subjects, as a means to indicate another thematic unit to be described. However, the iteration of a single connective element produces a monotonous effect. The fact that children often use direct speech can be seen as an attempt to neutralize such an effect. As such, the use of direct speech can be evaluated as a transitional device in marking syntactic dependency (cf. Berman & Slobin 1994: 177–79).

Adults make use of more expressive options of clause packaging. Although some adults produce texts that are similar in many respects to those produced by the children, many provide hierarchically built text frames. They stack connectivity devices across chunks of clauses, creating longer sequences of event packaging. This results in tightly woven texts, made up of units that are highly cohesive in both syntactic organization and thematic relevance. Compared to the children, adults used relatively more subordination and embedding of clauses. These findings seem to show that adults succeed better in the explicit linking of the propositions that underlie individual clauses.

It is interesting to note that syntactic complexity, in both children and adults, varies in relation to Genre and Modality, i.e. to the discourse mode. The ability to talk and write differently across different discourse modes can itself be seen as an important developmental feature. In the adult narratives, there is more explicit reference to connections between subsequent events. The increase of subordination also reflects a greater ability to express the idea that thematic units occur in sequence or simultaneously connected. It can tentatively be concluded that adults rely on a more textually motivated schema, from which they make more causal attributions to thematic units in their texts. The greater use of '*that* complements' in the adult texts is a case in point. Linguistically, it shows that adults command the means to express contrasting stances. This may reflect a greater ability of adults to evaluate states of mind.

An intriguing question is how such clause packaging is acquired. It can be hypothesized that clause package development results from regular and frequent opportunities to use language in a literate way. Literacy seems to play an important role in such later language development. Through reading, children are exposed to a variety of infrequent syntactic structures in different genre-specific contexts. Through writing, children get the chance to practice newly encountered structures in their own personalized texts. The distinction between different text genres permits greater precision, integration, reduction, and compression of information in the sentence, as well as new modes of cognitive, conceptual, and linguistic ordering in the text. However, in practice children are asked to write stories or expository texts without getting any instruction about the appropriate structural features (cf. Kress 1994). Another explanation of the drift in syntactic development over the school years comes from recent neuropsychological studies showing that, during adolescence, development occurs in the frontal lobe area which may facilitate language production (Thatcher 1997).

The present study also clearly demonstrates that different text types demand different clause packaging abilities. The mean length of T-units turned out to be significantly longer in expository compared to narrative texts, and in writing compared to speech — effects that applied equally to children and adults. A closer analysis of conjunctions reveals that the syntactic complexity in clause packaging varies by text type: in spoken narratives, co-ordination was the predominant clause packaging device, but in written expositions, various types of subordination were commoner. There was a clear interaction with age in this respect, since children used more co-ordination, whereas adults predominantly used subordination. Children showed an overgeneralization of 'and' as a clause linkage device, functioning as discourse glue (a similar finding was reported by Peterson & McCabe 1987, 1988). With respect to subordination in the adult texts, we found some striking differences in the proportions of devices used in the two genres. A greater proportion of temporal connectivity markers was evidenced in narratives, but a greater proportion of 'that' complements and conditionals in expositions. This finding is in line with earlier research (cf. Costermans & Fayol 1997).

Finally, we may conclude that a common pattern of distribution of clause packaging devices across Age, Genre, and Modality emerges across the five languages under consideration. The expressive devices for clause packaging differ from one language to the other, but the differences across Age, Genre and Modality tended to be quite similar. In no case did we find a significant interaction between Language and Age — or between Language, on the one hand, and Genre and Modality on the other hand. This finding seems to point to the fact that the constraints imposed by a particular native language only partially explain how texts are thematically organized. It provides evidence for the hypothesis that universal strategies underlie the development of clause packaging (cf. Berman 1998). Whatever their target language, children must learn to elaborate intersentential cohesive devices, so that independently represented entries in memory will form a coherent propositional system (cf. Karmiloff-Smith 1985).

The present study clearly has several limitations. First, the languages under consideration do not use all the conjunctions being studied. Consecutive co-ordination does not exist in Spanish. However, closer inspection of the data shows that this device is not very frequent in the other language samples either, so that these differences do not seem to have a large effect. In the vast majority of cases, the additive type of co-ordination with 'and' is preferred across the languages in our sample.

Our analysis could also be deepened in several ways. First, an attempt can be made to focus on the process characteristics of text production. We have dealt with stripped versions of text, leaving aside process characteristics in the language data: self-corrections, false starts, hesitations, and revisions. To gain greater insight into the language production process, an analysis of such monitoring is in order. Furthermore, in defining clause packaging, we have followed a strictly syntactic approach, leaving aside many other expressive options — such as adverbials, verb gapping, noun phrase ellipsis, and the use of non-clause-initial markers of sequentiality and other adverbial relations. Our analysis of patterns of formal language development needs also to be complemented with a form-function analysis. A transition should be made from grammaticized forms of connectivity to thematically motivated connectivity, constructing chunks of text subordinated to an overall motivated theme. We could then examine the extent to which the textual cohesiveness provided by these overt markings of connectivity tends to be confined to a narrowly local level of organization, rather than to the global organization of text segments. Starting from the more general assumption that individual forms take on more functions with development, differences across genres and across modalities can also be explored. As a next step, the analysis of cohesion markers in the text may also be complemented with an analysis of text coherence (see Peterson & McCabe 1991, Wright & Rosenberg 1993). Coherence relations in text can be classified in terms of cognitively salient primitives — such as the polarity of the relation, and the semantic or pragmatic character of the link between text units. Sanders & Van Wijk 1996a,b show how the hierarchical structure of expository texts can be analysed.

This study can be seen as a first step in uncovering clause packaging in text production from a developmental point of view. To arrive at a more reliable picture, it is necessary to analyze more data over different age groups. More data from the junior and senior high-school children may shed further light on the question of acquiring clause packaging devices. With respect to age differences in clause packaging in narrative, we hypothesize that, with age, there will be an increase in hierarchical organization — in which packages are marked off as episodes, and more causal attributions between packages are being made. In a similar vein, an increase in hierarchical organization of expository texts can be predicted, as evidence that clause packages link text units in a variety of semantic and pragmatic ways.

Note

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