

Information Density in the Development of Spoken and Written Narratives in English and Hebrew

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This study compares what we term *information density* in spoken versus written discourse by distinguishing between 2 broad classes of material in narrative texts: *narrative information* as conveyed through three types of propositional content—events, descriptions, and interpretations (Berman, 1997)—and *ancillary information* as conveyed by nonnovel, nonreferential, or nonnarrative material. One hundred sixty texts were analyzed across the variables of modality (writing, speech), development (4th-, 7th-, and 11th-grade students compared with adults), and language (English, Hebrew). Calculation of information density revealed no significant differences between languages, indicating that the analysis has general applicability. Increase in narrative information proved to be a function of modality rather than age, because, across the population, spoken texts contained far more ancillary material than written. By contrast, the *nature* of narrative content changed as a function of development, with interpretive material increasing with age. The study thus underscores 2 key features of narrative text construction: Modality has a distinct effect on information density, and, with age, the core of narrative information (events and descriptions) becomes fleshed out by interpretive and story-external elements.

This article concerns monologic text production, with the aim of comparing spoken and written narratives in developmental and cross-linguistic perspective. The

point of departure is the notion of information density as distinguishing between *narrative content* and *ancillary material* in monologic narrative discourse. Narrative content is conveyed by three categories of propositional information—events, descriptions, and interpretations (Berman, 1997), whereas ancillary material is nonnovel, nonreferential, or nonnarrative.

The study is guided by two main assumptions. First, the contrast between referential propositional content and ancillary material reflects differences between writing and speech (Biber, 1995; Halliday, 1989): Written discourse tends to contain mainly referentially informative content, whereas spoken texts contain a greater proportion of ancillary, communicatively motivated material. Second, the referential content of any piece of discourse is essentially genre dependent (Chafe, 1976). We therefore chose to focus our analysis on narrative discourse as a genre with strong theoretical and empirical underpinnings in discourse (Labov, 1972; Longacre, 1996) and developmental research (Berman & Slobin, 1994; Hickmann, 2003).

The flow and organization of information is a key issue in functional linguistics (Lambrecht, 1994). At the sentence level, scholars in the Prague tradition of “functional sentence perspective” (e.g., Daneš, 1974; Gundel & Fretheim, 2003) examine such notions as old–new, given–nongiven, topical–nontopical, and activated–nonactivated. Beyond the sentence, information structure and processing have been considered by scholars with different approaches to extended discourse in interactive conversation (e.g., Clark, 1996; Du Bois, 2003) and in monologic texts (e.g., Biber, 1988; Longacre, 1996).

We, too, consider that the structure and organization of linguistic information needs to be analyzed in discourse-embedded contexts and that the discourse event is shaped by the interaction between the dimensions of modality (speech, writing) and genre (narrative, nonnarrative). However, our concern is not with “information packaging” (e.g., Foley & Van Valin, 1985) or “information flow” (e.g., Chafe, 1994) but with what we term *information density*, defined as the ratio of genre-dependent content to ancillary information appearing in a text.

SPEECH VERSUS WRITING

Differences between speech and writing have been investigated as two modes of language production (Chafe, 1994; Strömquist, Nordqvist, & Wengelin, 2004) and as two distinct styles of discourse (Ravid & Tolchinsky, 2002). Each modality entails particular constraints and “production costs” (Clark & Brennan, 1991). Thus, spoken communication is typically produced under the pressure of rapid online processing, whereas displaced time in writing allows for more planning and monitoring in offline production. However, the act of writing also imposes a greater

cognitive burden—most particularly in the case of nonexpert writers such as children. This difference in processing combines with the different communicative contexts of the two modalities: Spoken language is typically personalized and interactive, whereas written language is produced in more detached settings. As a result, texts produced in these different circumstances differ markedly in overall discourse stance (Berman, 2005) and in linguistic encoding (Jisa, 2004; Ravid & Zilberbuch, 2003).

Written language, which is not produced under the same time pressure as spoken, allows for revision and rewriting, hence more preplanning and ongoing monitoring, so that written texts tend to be better organized and more coherent than spoken language. In addition, in linguistic usage, writers have more time and are cognitively freer to retrieve the appropriate lexical items and grammatical constructions than are speakers. Chafe (1992) found that in terms of information flow, writing fosters inclusion of several new ideas within a single idea unit, with speaking limited to one new idea per unit. Halliday (1989) showed that written sentences have greater density, both lexical (more content words) and phrasal (more complex noun phrases). Biber's (1988) corpus-based analyses of different text types likewise led him to conclude that writing provides more opportunity than speech for greater complexity and variety in linguistic expression. Prior research thus demonstrates that online speech processing compared with offline written text production affects the flow of information in discourse. Consequently, we can expect differences in the proportion of propositional content to ancillary material depending on modality of text production.

THE ROLE OF GENRE

We propose that communicatively rather than propositionally motivated ancillary material may be largely shared across different types of discourse.¹ Conversely, categories of propositional content will differ by genre. Our analysis of information density therefore is motivated by the inherent properties of *narrative* discourse, as distinct from, say, conversation, description, or exposition. Narratives refer to the unfolding of events, to the circumstances attendant on these events, and to the participants in these events and their subjective evaluation of these events and circumstances. Narrative thus constitutes a highly distinctive type of discourse (Steen, 1999) and represents a unique mode of thought (Bruner, 1986). In principle, then, the same criteria should apply to various nar-

¹For example, the categories defined as *disfluencies* in a study of task-oriented conversations (Bortfeld, Leon, Bloom, Schober, & Brennan, 2001) are highly consistent with what we define as *ancillary* material in our corpus of monologic narratives.

rative subgenres—personal experience accounts like those analyzed in the following sections, as well as, say, mystery or romance.

CROSS-LINGUISTIC COMPARISONS

Cross-linguistic studies of oral narrative development (e.g., Berman & Slobin, 1994; Hickmann, 2003) suggest that target language has a marked impact on “thinking for speaking” (Slobin, 1996) and how native speakers of different languages use linguistic forms to encode narrative content. Our study, however, is not concerned with grammatical constructions and lexical items, *per se*, but rather with their informative content and function. We thus do not expect to find marked differences in texts produced by monolingual speaker–writers of Californian English and Israeli Hebrew who share the same levels of schooling and come from mainstream middle-class backgrounds in two culturally relatively similar environments.

LANGUAGE DEVELOPMENTAL IN THE SCHOOL YEARS

Our study concerns later language development—from childhood across adolescence. Current research in this domain reveals marked developments in linguistic proficiency across the school years, interfacing with sociocognitive developments and increasing communicative competence (Berman, 2004; Nippold, 1998; Ravid & Cahana-Amitay, 2005). Developmentally, we thus expect the written and spoken versions of the same story to diverge increasingly from childhood to adolescence and adulthood as a function of age and of greater experience with literacy-related activities (Ravid & Tolchinsky, 2002; Strömqvist et al., 2004).

PROPOSITIONAL CONTENT AND ANCILLARY MATERIAL IN NARRATIVES

The crux of our proposal is that narratives contain two types of material—narrative content and ancillary elements—and that the ratio between these two changes as a function of modality (writing versus speech) and possibly also as a function of development. Propositional content is genre specific and, in the case of narratives, can be broken down into three categories (Berman, 1997; Labov 1972, 1997): events and two types of evaluation—descriptions and interpretations. Ancillary elements are nonnovel, nonreferential, or nonnarrative material. Figure 1 depicts these constituents of narrative discourse.

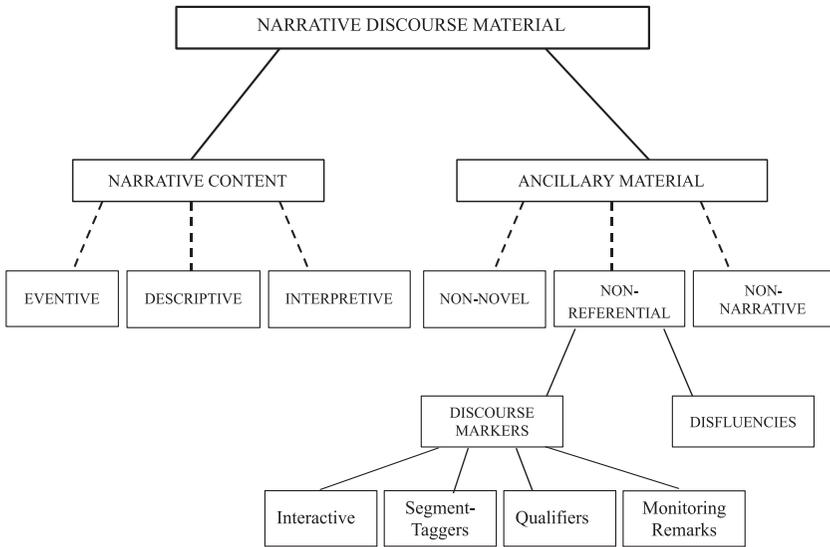


FIGURE 1 A taxonomy of narrative discourse material.

Types of Narrative Information

The *propositional content* of a text must, by definition, contain *novel information*. In narratives, such material relates the actions and events that make up the story, the circumstances surrounding them, and how these are interpreted by the narrator. Following the tripartite division proposed in Berman (1997), we distinguish three classes of informative material that constitute a narrative text: events, descriptions, and interpretations. These three types of narrative content are illustrated in the four written texts given in Appendix A, one from each age group.²

Eventive information represents the chain of events that define the story's plotline (Berman & Slobin, 1994) and report what happens as the story unfolds. Like Labov's (1972) "narrative" clauses, these dynamic, plot-advancing elements are related by ties of temporal sequentiality and so meet Reinhart's (1984) criterion for foreground "narrativity." Here, eventive material refers to happenings that occurred at a specific time and place (and in this, they differ from situations that are habitual or protracted, as noted later). Eventives are thus typically encoded linguistically by (past) tensed forms of lexical verbs (not *be* or *have*). For example, we defined the underlined material in (1) following—the second text in Appendix A, written by an English-speaking junior high school student—as "eventive."

²A more detailed and motivated account of these three types of narrative material is provided in Berman and Ravid (in press).

(1) Story written by a 7th-grade boy (eJ05mnw)³

A kid named Phil and I used to get in a lot of fights and arguments.

One day my friends and I doorbell-ditched his house while his grandparents were home. His parents found out and called our parents. Then our parents made us go up and apologize to the grandparents.

In our analysis, eventive material functions to anchor the other two types of narrative information—description and interpretation—in a coherent narrative frame. These two noneventive types of content are typically stative rather than dynamic or active and subdivide the Labovian notion of “evaluation” into two distinct categories.

Descriptive information refers to facts rather than events, the states of affairs or circumstances (time, place, and motivations) that provide additional information on the events that make up the story, corresponding to Reinhart’s (1984) category of “informative background.” *Descriptives* are linked to the events by *nontemporal contingencies* (e.g., cause, purpose, concession) as illustrated by the following clauses from the adult’s narrative in (4) of Appendix A: “... resulting in a few harsh words, much hurt, and a great deal of tension. Although throughout those first months of my marriage this conflict seemed unsolvable ...” *Nonsequential temporal* relations laying outside the sequence of events that make up the plotline are another type of descriptive material. These typically express simultaneity, in which events co-occur in time—like the subordinate clause “while my grandparents were at home” in (1)—and retrospection, referring to situations or events that occurred before the story—like the introductory sentence in (1) “A kid named Phil and I used to get into lots of fights and arguments.”

Interpretive (or *attitudinal*) *narrative content* is most like canonic narrative evaluation (Segal, 2001). It expresses narrators’ attitudes and perspectives on events and circumstances and their subjective commentary on the inner states that the narrator attributes to participants. One example is the narrator’s interpretation (from the high school text in Appendix A) of why his rival was popular, “because he was feared, not respected or loved.” Another, from the adult text in Appendix A, is the narrator’s comment on how the two parties related to their conflict, as “the difficult but genuine open communication between my in-laws and me about what our varying perspectives on these issues were.” As these examples show, interpretives, like descriptives, are typically stative rather than dynamic predications; however, unlike descriptives, they are inferential or subjectively attitudinal rather than objectively factual.

³In specifying text names, the following notation is used: language (e = English, h = Hebrew), age group (G = grade school, J = junior high school, H = high school, A = adult), sex (f, m), subject number (01 to 20), genre and modality (ns ~ nw).

Narrative information is divided into elements that we term *information units*. As marked up before each such element in Appendix A, an information unit in the sense used here conveys *novel narrative information* (eventive, descriptive, or interpretive). Our notion of information unit thus has the following properties: First, it is a unit of *narrative* information; second, it conveys *novel* information; third, it conveys a *single* piece of narrative information; fourth, it represents a realization of one of the three categories of narrative content specified by our model—eventive, descriptive, interpretive. In other words, this notion of “information unit” is confined to units of *narrative*, as distinct from units of discourse information in general. Further, in our analysis, an information unit is not identifiable with either a semantic proposition or a syntactic sentence. Rather, information units refer to elements of *discourse content* rather than of semantics or of grammar, to focus on information density as isolated away from the topic of discourse, on the one hand, and from syntactic structure, on the other hand. As such, they are propositionally comparable to Chafe’s (1994) discourse-functional “idea units.” The question of whether and how these units map onto linguistic constructions is an interesting issue that lies outside the scope of this study.

Ancillary Material

The other major block of material in discourse fails to add to the informational density of a text and conveys information that is *ancillary* in the following highly specific sense: They do not encode *new* narrative information—events, descriptions, or interpretations. Such “excess” material is illustrated by the underlined items in (2), the oral version of the same story that this junior high school boy had previously produced in writing, as in (1) previously.

(2) Story told orally by a 7th-grade boy (eJ05mns)

Well, it’s not my brother, but one guy one time this kid named Phil, we were like just getting in fights about arguments and stuff, and his like his parents were weird and stuff. So so then we doorbell-ditched him one day. And like he like had like his grandparents over or something. And they got really mad. So so then we had to run around the street. And then his parents found out and then they called our parents, and we had to go up and apologize to them. And the grandparents that we didn’t even know we had to go apologize to them. That’s how it ended.

The oral version of the story in (2) is more than double the length of its written counterpart in (1)—110 compared with 50 words. Although the narrator told it after he had written the same story, it describes the same set of events and adds very little new propositional content that is typically noneventive (e.g., that his parents were weird, that he had his grandparents over). The two versions contrast mainly in

the amount of ancillary material that inflates the oral text in (2) compared with its written counterpart in (1).

We identified three classes of such ancillary material: (a) reiterations that convey nonnovel narrative content; (b) collateral, nonreferential material such as discourse markers and disfluencies; and (c) nonnarrative, story-external propositional content.

Nonnovel Narrative Content: Reiterations.

This type of ancillary material reiterates or reformulates narrative information (eventive, descriptive, or interpretive) that is nonnovel because the information it provides has already been conveyed to the reader–hearer, for example, the repeated information that “we had to go and apologize” near the end of (2). This reformulated material may *precede* information that appears subsequently, in which case it can still constitute a redundant reiteration, like the phrase “this guy” at the beginning of (2).

Such reiterations correspond in part to what Clark (1996) termed “resumptions” in discussing the cooperative nature of conversational discourse; they also recall what Du Bois (2004) defined as engaging the interlocutor by means of “dialogic syntax” in conversation. In monologic narratives like (2), reiteration of prior material, in the same words or paraphrased, reflects two distinct features of oral narratives. On the one hand, reiteration reveals difficulties of online processing of speech output so that speakers repeat themselves in the course of ongoing text production, restating what they have already said while planning what else to say, as a “place-holding” strategy. On the other hand, reiteration or rewordings may express a need for emphasis, to highlight emotionally charged contents, as when a woman (eA16fns) says of her co-worker antagonist “She was just being unreasonable, I mean just being totally unreasonable.” Such emotionally charged reiterations are illustrated in (3) from the opening part of the oral version of the narrative written by the same woman in Appendix A.

(3) Excerpt from a story told orally by an adult (eA16fns)

Okay, I know right away um I’ve had a big conflict going on in my life since uh I got engaged, and that was between me and my at then future in-laws and now current in-laws, particularly my mother-in-law, who had um a very distinct idea about what I was going to be like, what I should be like as her daughter-in-law and the wife of her son.

Reiterations differ from other ancillary material, because they do contain propositional content, but the content they convey is not new for the hearer. They cannot be dismissed as mere “disfluencies,” because they may aid both speakers and hearers in the task of online processing. In fact, current research indicates that even disfluencies serve a communicative purpose in aiding both speakers (Bortfeld,

Leon, Bloom, Schober, & Brennan, 2001) and listeners (Brennan & Schober, 2001) in the course of processing spoken language output and input. In addition, they also may have a rhetorical function of highlighting key points of content in the ongoing discourse.

Nonreferential Material

The second class of ancillary elements are *nonreferential* in the sense that they fail to convey propositional content, novel or otherwise. They are close to what Clark (1996) termed “collateral material,” in the shape of a second conversational “track”—not the one concerned with carrying out “official business” (like our informative material) but the one that “attempts to create a successful communication” (p. 241). We distinguish two classes of nonreferential material (see Figure 1): (a) disfluencies and (b) discourse markers.

Disfluencies. These include false starts, repairs, repetitions, and fillers that can be attributed to the pressures of rapid, online output in producing spoken discourse—of the kind generally analyzed for interactive conversational discourse (Bortfeld et al., 2001; Clark & Wasow, 1998).⁴ Such disfluencies are indicated by the underlined items in the oral narrative in (4), by the 11th grader whose written narrative is given in Appendix A.⁵

(4) Story written by an 11th-grade boy (eH08mns)

When I was uh when I was in fifth grade, I finally stood up to someone in my class that had that had been bothering me for quite a while. And ever since kindergarten he had been a person who was who was popular in the class not because um not because he was someone that everyone loved or really admired. It was because, it was more like um it was more like because they were afraid of him. And they thought that if they they joined his pack, then it would be um safer for them. And um and had had made um made life really um and the and the school year without fun for a number years for a lot of people, and and finally in in second grade I, no it was fifth grade, he he finally went so far that I actually I actually acted against him. I would have I would have just ignored it as as being something that um had been going on for a while, something that you know his nature. And then um then he just he just interrupted a conversation that I was having with someone and he told me to shut up and he pushed me and and I just and I just pushed him back, you know because just to show him I wasn't going to take that, because it was my it was my conversation, and and he was

⁴Our analysis disregards nonlexical filler syllables of the kind analyzed in Clark and Fox Tree (2002) and Bortfeld, Leon, Bloom, Schober, and Brennan (2001). English syllables like *er*, *um*, in Hebrew rendered by *eh*, *em*, are indicated as such in our transcriptions.

⁵In marking repetitions, false starts, and other such disfluencies, the *first* of the repeated elements is underlined.

he was almost like an uninvited person intruding into it and um he didn't want to take that either, so he kicked me and I returned that to reinforce what I was trying to say before. And um that's basically the end of it. He through through physical action he learned what what he couldn't have learned through um speaking and compromising. And I know that's that's what people always say is the key to solving conflicts, but there's certain occasions where that doesn't work. I think that's it.

The oral text in (4) contains numerous indicators of disfluent online processing in the underlined material—false starts, repairs, and repetitions—even though this boy had some moments earlier produced a written version of the same story. In general, we found numerous such disfluencies in the oral narratives in our sample, in marked contrast to their written counterparts, whose original handwritten versions contain very few erasures and insertions. We suggest that these “disfluencies” play the role of place-holding strategies in on-going oral output and that they are incurred by modality-specific processing constraints rather than serving a rhetorical purpose such as emphasis or engagement.

Discourse markers. The other type of “nonreferential” material are elements that are termed variously “discourse markers” (Jucker & Ziv, 1998; Schiffrin, 1995), “pragmatic markers” (Brinton, 1996), or “*particules énonciatives*” (Fernandez, 1994). These typically do not constitute part of the referential content of a proposition but serve various kinds of “procedural” or communicative functions (Maschler, 2002; Ziv, 1998). They can be single words, like English *okay*, *good*, *well*, *like*, or multilexemic expressions like *so that's that*, *kind of*, *all sorts of*, and *all that stuff*.

Discourse marking elements have been the subject of considerable prior study, although only occasionally in developmental perspective (e.g., Andersen, 1996; Pak, Sprott, & Escalera, 1996). Two features of such expressions served for us to assign an item to this category: Semantically, they fail to provide novel referential information, and syntactically, they occur in positions and perform functions that violate the grammatical constraints on their literal counterparts. Compare, for example, English *well* as a manner adverb in a sentence like “*He speaks well but writes poorly*” and as a discourse marker in “*Well, if that's what you want ...*”—and in the opening to the oral 7th-grade narratives in (2) and (4b). Along similar lines, the Hebrew adjective *pashut* ‘simple’ occurs postnominally and agrees for number and gender with its head noun (e.g., *sipur pashut* [a] ‘simple story’ versus *sipur-im pshut-im* ‘simple+PL stories’) but these grammatical constraints fail to apply when it is used as a discourse marker as in *hu pashut loh yaskim* ‘He simply [= just] won't agree.’⁶ We distinguished four subtypes of such discourse-marking

⁶Different and complementary criteria for stipulating what to specify as a *discourse marker* are given by Maschler (2002) and Brinton (1996).

elements: (a) markers of interactive communication, (b) segment taggers, (c) qualifiers, and (d) monitoring comments.

Interactive items are explicitly sender- or addressee-oriented and are interactively communicative in intent. Examples are expressions like *I mean, you know*, which are more suited to conversational interchanges than monologic texts. In our sample, they occur mainly in the oral texts, which were produced in the presence of the investigator.

Segment taggers occur at the beginnings or ends of utterances or clauses, and signal the opening or closing of the segment in question. Examples are segment-initiators like *okay, well, and so* and segment-final items like *that's about it, so there you are*. These were defined as discourse markers in cases in which they met at least one of our two criteria: Semantically, they do not have clearly conventional referential content (e.g., *so* does not mean “therefore, as a result”) or syntactically, they occur in a nonconventional position, for example, *well* at the beginning of an utterance, *though* at the end of a clause.

Qualifiers combine two classes of pragmatically related discourse markers: *intensifiers* that serve to enhance and *hedges* that detract from the literal, truth-value content of a proposition. These take the form of quantifying and other intensifying items like *a whole lot, really, terrifically* as well as items that “hedge” or lower the speaker-writer’s commitment to a statement like *sort of, like, basically*.

Monitoring elements express online commentary on what the narrator is saying or writing and so serve a different communicative function than what we refer to as “interactive” discourse marking elements. They involve *metalinguistic* or *metacognitive* monitoring, referring to what the speaker is saying or trying to say—for example, *how can I say, let's say, let's see now, not exaggerating* (corresponding partly to what Bortfeld et al., 2001, termed *editing expressions*)—or to introspective comments about speaker-writers’ processes of storytelling and recall, such as *I don't really remember, I'm not too sure, what I think happened is that*
....

These different kinds of ancillary material—reiterations, disfluencies, and discourse markers—abound in the underlined elements of the stories told by a 7th grader in (2) and by a high school boy in (4), and they are also common in adult oral narratives.

Story-External Material

A final category of material we considered in relation to information density in narrative texts is not strictly speaking “ancillary,” because it conveys information that is both novel (unlike reiterations) and referential (unlike discourse markers and disfluencies). Conversely, story-external elements do not form part of the narrative information units, because they lie outside of what we define as *the story frame*: They provide metatextual and intertextual commentary on the topic of the

narrative or on the narrator's construal of the nature of storytelling in general. As such, this extra narrative type of material supplements but differs from what we termed *monitoring* discourse markers. Story-external content is illustrated by the opening section of the story written by a high school student in Appendix A, repeated here as (5a) and at the end of his oral story in (4), reproduced here as (5b).

(5a) Opening segment of story written by an 11th-grade boy (eH08mnw)

Not a single life in all of recorded history has been free from obstacles and problems. My own experiences prove that my life is not an exception to this general rule. Throughout my life I have experienced internal conflicts, but I have also had to grapple with problems involving others.

(5b) Closing part of story told orally by the same 11th-grade boy (eH08mns)

And I know that's that's what people always say is the key to solving conflicts, but there's certain occasions where that doesn't work.

Story-external elements like these are not part of the story itself, yet they convey a sophisticated type of information. They are atypical in terms of canonic narrative structure and content, because they depart from story-anchored events, descriptions, and interpretations to provide expository-like generalizations and metatextual commentary.

In sum, we conceive of narrative information density in terms of different layers of discourse material: three types of novel narrative content (events, descriptions, interpretations) and three types of nonnovel or nonreferential and hence "ancillary" material: nonnovel referential material (reiterations), nonreferential material (disfluencies and discourse markers), and extranarrative, story-external material. These different categories were applied to the database described as follows.

METHODOLOGY

Database

The database for this analysis is part of a larger sample of texts collected by parallel procedures in the framework of a cross-linguistic project on developing text production (motivations and procedures are detailed in Berman and Verhoeven, 2002; see also Berman & Katzenberger, 2004). This study analyzed 160 narrative texts, divided equally across two languages (Californian English, Israeli Hebrew), two modalities (writing, speech), and four age groups (4th graders aged 9 to 10 years, 7th graders aged 12 to 13 years, high school juniors aged 16 to 17 years, and graduate student adults). To elicit narrative texts, all participants were first shown

the same short video film without words, depicting unresolved situations of interpersonal conflict (moral, social, and physical). They were then asked to tell and write a story about an incident in which they themselves had been involved in a situation of problems between people. Half the subjects first told the story orally and then wrote it by hand (not on computer),⁷ and half first wrote the story and then told it orally.

Units of Analysis

In analyzing the 160 texts in our sample, we used two units of analysis: information units as elements of narrative discourse and clauses as units of syntax. As noted earlier, information units refer to elements of narrative discourse content rather than of semantics or of grammar. Specifically, in our analysis, an information unit conveys one piece of *novel narrative information* (eventive, descriptive, or interpretive) and as such is not identifiable with either a semantic proposition or a syntactic sentence. As a basic syntactic–semantic measure, we used the *clause*, defined as “any unit that contains a unified predicate ... that expresses a single situation (activity, event, state)” (Berman & Slobin, 1994, p. 660).

In contrast to the innovative notion of information unit, the clause has been a well-established unit of analysis in psycholinguistic approaches to discourse since Labov’s (1972) seminal work on adolescent narratives (e.g., Lord, 2001) and has proven to be a robust and valid tool in analyzing both oral and written narratives and expository discourse across a range of languages, including English and Hebrew (Berman & Verhoeven, 2002; Jisa, 2004; Ravid & Zilberbuch, 2003). In the current context, the clause helped to specify the boundaries of narrative information units as less than a clause (a word or phrase), a single clause, or a combination of two or more clauses, although typically not longer than 3 or 4 clauses (Katzenberger, 2004; Nir-Sagiv, 2004).⁸ Number of clauses also overcomes the problem of differences in text length when calculating the distribution of ancillary elements.

Coding Procedures

Each of the 160 texts was analyzed by the two of us and Bracha Nir-Sagiv, a graduate student of linguistics. All three of us are native speakers of Hebrew or English and are

⁷The adults in the English-speaking sample wrote their narratives on computer, but as noted in the Results section, this did not entail any differences in information density compared with the Hebrew adults’ handwritten texts.

⁸Examples of interpretive elements of less than clause length are provided by the two italicized words in the following excerpt from the narrative written by another graduate school woman. (eA16fnw) “My future in-laws’ *preconceived* notions about womanhood, about being a wife ... were an *inevitable* source of conflict.”

almost equally proficient in both languages. Intercoder agreement reached 89%, and differences were resolved by discussion between us. Results of our coding were entered on a separate coding sheet per text, as illustrated in Appendix B.

ANALYSIS AND FINDINGS

Results are presented here for the narrative categories we specified above across the variables of age, language, and modality. We first compared the overall distribution of narrative versus ancillary material and then analyzed different categories of these two types of material.

As background, a preliminary analysis of *text size*, measured by average number of clauses per text, yielded the results shown in Table 1 by age group, language, and modality.

The data in Table 1 show that text sizes in clauses increased with age, from grade school ($M = 19.02$) and junior high (19.15) to high school ($M = 31.93$) and adults ($M = 35.83$), $F(3, 72) = 8.94, p < .0001$, with the cut-off point between junior high and high school ($p = .05$). English texts were longer on average ($M = 30.4$) than Hebrew ($M = 22.56$), $F(1, 72) = 7.27, p < .01$, although spoken texts were longer ($M = 31.76$) than written ($M = 21.2$), $F(1, 72) = 32.78, p < .0001$, regardless of the factors of age and language.

PROPOSITIONAL NARRATIVE CONTENT AND ANCILLARY MATERIAL

Because texts were of unequal length, the narrative versus ancillary material they contained was analyzed by proportional distribution. Table 2 presents the relative amounts of material that conveys (novel) propositional *narrative content* in the texts by age, language, and modality. Ancillary material is the corollary of these figures.

As the data in Table 2 show, spoken texts contained about half the amount of novel narrative information ($M = 48.9\%$) as the written ($M = 89.6\%$) texts, $F(1, 72) = 416.29, p < .0001$, regardless of the factors of age or language.

Categories of Narrative Content

This section examines the relative proportions of the three types of novel narrative information (eventive, descriptive, interpretive). Figures 2 and 3 present the internal distribution of such material in the texts by age and modality in each language. Appendix C provides the full data on which Figures 2 and 3 are based.

TABLE 1
Mean Number of Clauses and Standard Deviations in 160 Narrative Texts, by Age, Language, and Modality

| | <i>Grade School</i> | | | | <i>Junior High</i> | | | | <i>High School</i> | | | | <i>Adults</i> | | | |
|--------------------|---------------------|-----------|---------------|-----------|--------------------|-----------|---------------|-----------|--------------------|-----------|---------------|-----------|----------------|-----------|---------------|-----------|
| | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | |
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| Spoken narratives | 25.70 | 10.41 | 24.40 | 24.31 | 21.40 | 11.02 | 21.60 | 12.63 | 46.70 | 18.51 | 27.30 | 14.16 | 45.30 | 21.63 | 41.70 | 29.53 |
| Written narratives | 14.90 | 8.45 | 11.10 | 8.72 | 18.60 | 10.15 | 15.00 | 8.10 | 36.70 | 14.82 | 17.00 | 6.62 | 33.90 | 13.83 | 22.40 | 12.49 |

Note. *N* = 10 per group.

TABLE 2
Mean Percentages and Standard Deviations of Novel Narrative Information,
by Age, Language, and Modality

| | <i>Grade School</i> | | | | <i>Junior High</i> | | | | <i>High School</i> | | | | <i>Adults</i> | | | |
|--------------------|---------------------|-----------|---------------|-----------|--------------------|-----------|---------------|-----------|--------------------|-----------|---------------|-----------|----------------|-----------|---------------|-----------|
| | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | |
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| Spoken narratives | 51.03 | 8.28 | 56.44 | 16.41 | 43.93 | 12.64 | 43.67 | 13.81 | 45.26 | 13.67 | 47.46 | 18.96 | 52.82 | 15.72 | 50.45 | 13.19 |
| Written narratives | 94.36 | 8.06 | 88.56 | 10.50 | 93.70 | 7.33 | 90.85 | 8.79 | 87.00 | 8.92 | 88.00 | 12.06 | 90.83 | 6.70 | 83.84 | 9.67 |

As shown in Figures 2 and 3, the proportion of *eventives* decreased with age, with grade schoolers ($M = 53.49\%$) differing markedly from the other three groups (junior high, $M = 39.31\%$; high school, $M = 28.85\%$; and adults, $M = 28.89\%$), $F(3, 72) = 12.64$, $p < .0001$, regardless of language or modality. By contrast, *descriptives* remained at the same level across age groups, and *interpretives* increased as a function of age, with grade schoolers ($M = 2.62\%$) and junior high students ($M = 8.57\%$) in one subset and the two older groups (high school, $M = 18.27\%$) and adults ($M = 23.02\%$) in another, $F(3, 72) = 21.55$, $p < .0001$, with the cut-off point between junior high and high school, regardless of language or modality.

Ancillary Material

The narrative content analyzed here consisted typically of units equal to or larger than a clause, and the internal distribution of eventive, descriptive, and interpretive units was calculated from the total novel narrative content. By contrast, ancillary material of the kind analyzed in this section typically consists of clause-internal items. Most analyses of different types of ancillary material were thus conducted as number of items over number of clauses (i.e., items per clause).

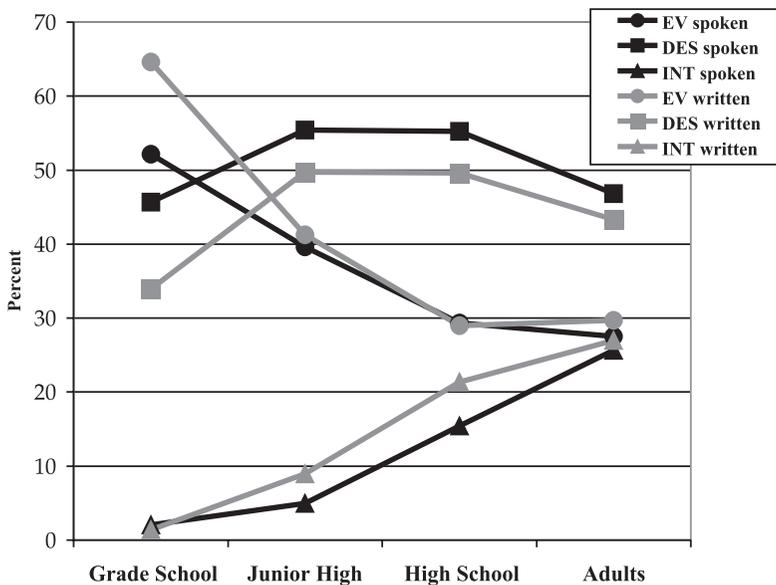


FIGURE 2 EV = eventive; DES = descriptive; INT = interpretive. The distribution of eventive, descriptive, and interpretive material in spoken and written English narratives.

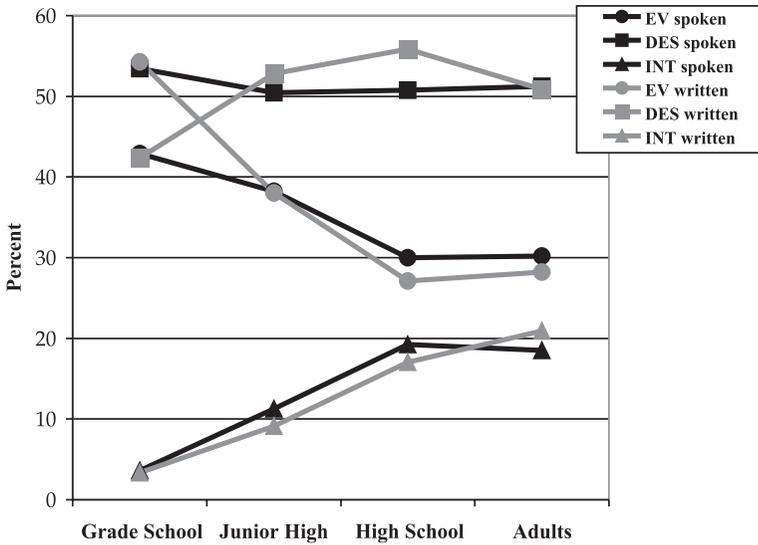


FIGURE 3 The distribution of eventive, descriptive, and interpretive material in spoken and written Hebrew narratives.

Ancillary Material Across Speech and Writing

Not all the categories we labeled as conveying “ancillary information” were found across both speech and writing, because some occurred only in the spoken texts. To start, we compared those ancillary categories that occurred in both modalities: reiterations, the two subcategories of discourse markers that occurred in both modalities (Segment Taggers and Qualifiers), and story-external (nonnarrative) commentary. Table 3 presents amounts for each of these per clause.

The data in Table 3 show that reiterations displayed an effect only for modality, with spoken texts showing more ($M = 0.06$) reiterations per text than written ($M = 0.02$), $F(1, 72) = 37.97, p < .0001$. Segment taggers also showed an effect for modality: Spoken texts averaged more (0.19) per clause than written (0.02), $F(1, 72) = 102.08, p < .0001$, but unlike reiterations, segment taggers revealed an effect for age, because in the spoken texts, the two middle age groups have far more segment taggers than the youngest and oldest groups, $F(3, 72) = 3.2, p < .03$, indicating a U-shaped curve. Moreover, these effects for age interact with the factor of modality, $F(3, 72) = 4.02, p < .02$, as depicted graphically in Figure 4, which shows that the U-shape development distinguishing the junior high and high school students from the grade schoolers and adults in use of segment taggers derives entirely from the spoken, not from the written texts.

TABLE 3
 Mean Numbers and Standard Deviations of Reiterations, Segment Taggers, Qualifiers, and Story-External Commentary
 per Clause in Narrative Texts, by Age, Language, and Modality

| | <i>Grade School</i> | | | | <i>Junior High</i> | | | | <i>High School</i> | | | | <i>Adults</i> | | | |
|--------------------|---------------------|-----------|---------------|-----------|--------------------|-----------|---------------|-----------|--------------------|-----------|---------------|-----------|----------------|-----------|---------------|-----------|
| | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | |
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| Spoken narratives | | | | | | | | | | | | | | | | |
| Reiterations | .090 | .050 | .060 | .050 | .040 | .030 | .080 | .080 | .050 | .040 | .070 | .070 | .060 | .050 | .050 | .070 |
| Segment taggers | .120 | .080 | .170 | .130 | .310 | .150 | .210 | .200 | .180 | .110 | .260 | .240 | .120 | .100 | .130 | .120 |
| Qualifiers | .190 | .110 | .150 | .150 | .440 | .280 | .360 | .340 | .290 | .190 | .260 | .230 | .210 | .230 | .160 | .140 |
| Story externals | .010 | .020 | .001 | .004 | .030 | .040 | .009 | .020 | .040 | .040 | .020 | .030 | .050 | .050 | .040 | .060 |
| Written narratives | | | | | | | | | | | | | | | | |
| Reiterations | .020 | .030 | .006 | .020 | .006 | .020 | .030 | .050 | .020 | .020 | .020 | .040 | .020 | .050 | .020 | .040 |
| Segment taggers | .008 | .020 | .070 | .080 | .004 | .010 | .030 | .060 | .010 | .020 | .010 | .030 | .006 | .010 | .003 | .009 |
| Qualifiers | .009 | .030 | .040 | .060 | .020 | .030 | .020 | .040 | .030 | .040 | .060 | .080 | .020 | .030 | .090 | .090 |
| Story externals | .010 | .040 | .010 | .030 | .008 | .030 | .000 | .000 | .030 | .060 | .020 | .030 | .020 | .020 | .020 | .030 |

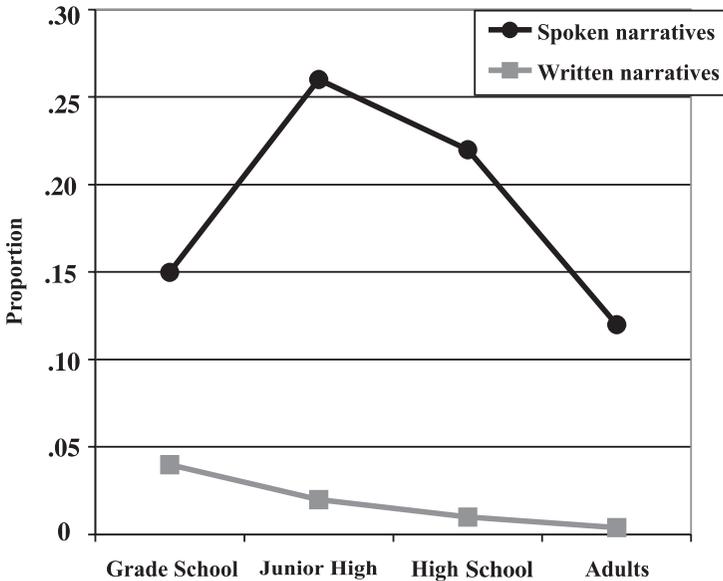


FIGURE 4 Interaction of age and modality in the ancillary category of segment taggers.

A very similar picture emerged for qualifiers that, as shown in Figure 5, also revealed a U-shaped developmental curve, with highest occurrence in the two middle age groups, $F(3, 72) = 3.43, p < .03$. Qualifying discourse markers, too, were more frequent in the spoken texts ($M = 0.26$ qualifiers per clause) than in the written texts ($M = 0.04$), $F(1, 72) = 82.78, p < .0001$: These effects were qualified by an interaction of Age \times Modality, $F(3, 72) = 5.65, p < .003$.

Story external commentaries were infrequent overall, with rather more in spoken ($M = 0.03$) than written texts ($M = 0.01$), $F(1, 72) = 6.93, p < .02$, and, as shown in Figure 6, a different developmental curve depending on modality: These elements increase markedly with age in the spoken texts but not in writing, where they remain infrequent across age-groups, $F(3, 72) = 2.79, p < .05$.

Ancillary Material in the Spoken Modality

This section compares the different types of ancillary elements that were confined to the spoken texts: repairs (which include false starts, repetitions, and various other types of disfluencies) and discourse markers (interactive, segment tagging, and qualifying), that is, excluding “monitor”-type comments, considered separately later. As shown in Table 4, Repairs revealed a close-to-significant effect of language, with far more repairs per clause in Hebrew ($M = 0.24$) than in English ($M = 0.17$), $F(1, 72) = 3.74, p = .057$. Discourse markers revealed a U-shaped develop-

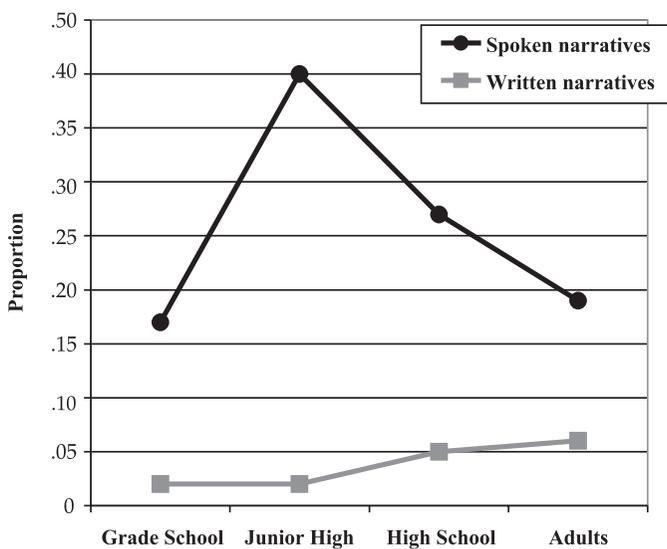


FIGURE 5 Interaction of age and modality in the ancillary category of segment taggers.

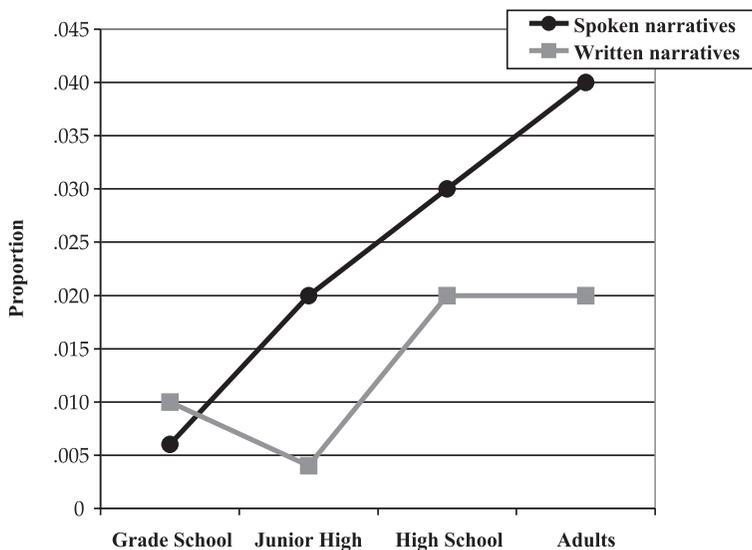


FIGURE 6 Interaction of age and modality in the ancillary category of story-external commentary.

TABLE 4
Mean Numbers and Standard Deviations of Repairs and Discourse Markers
per Clause in Spoken Narrative Texts, by Age and Language

| | <i>Grade School</i> | | <i>Junior High</i> | | | | <i>High School</i> | | | | <i>Adults</i> | | | | | |
|-------------------|---------------------|-----------|--------------------|-----------|----------------|-----------|--------------------|-----------|----------------|-----------|---------------|-----------|----------------|-----------|---------------|-----------|
| | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | |
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| Repairs | .25 | .16 | .21 | .14 | .19 | .11 | .29 | .23 | .13 | .10 | .29 | .26 | .12 | .10 | .17 | .11 |
| Discourse markers | .34 | .17 | .33 | .18 | .79 | .38 | .57 | .32 | .54 | .28 | .57 | .41 | .39 | .28 | .33 | .19 |

ment, peaking in 7th grade ($M = 0.68$) and 11th grade ($M = 0.56$), with far fewer among the adults ($M = 0.36$) and least of all among 4th graders ($M = 0.33$).

Disfluency in Spoken Texts

Our final analysis concerned those ancillary categories that most markedly downgrade informative density in the spoken texts: reiterations, repairs, and three of the four types of discourse markers—interactives, segment taggers, and qualifiers. Table 5 gives their combined percentage in relation to the total amount of ancillary material in the spoken texts.

As shown in Table 5, disfluencies decrease significantly with age, with 4th graders ($M = 98.2\%$) and 7th graders ($M = 96.02\%$) showing the most disfluency and adults the least, although the 11th graders were intermediate ($M = 92.43\%$), $F(3, 72) = 8.31, p < .0001$.

DISCUSSION

We summarize our main quantitative findings and follow with a discussion of narrative content as a function of development and information density as a function of modality.

Summary of Results

An interesting finding that supports the general applicability of our model is the lack of significant differences between English and Hebrew in either information density or the internal distribution of narrative and ancillary information. The two languages differed only in number of clauses (the English texts were longer on average) and in the fact that the Hebrew texts tended to contain more repairs. These differences probably can be attributed to general cultural factors and the overall setting of data elicitation in California compared with Israel, intriguing issues that lie beyond the scope of this analysis. Overall, our model revealed identical findings in two typologically distinct languages and so may be considered independently of language-particular features. The following paragraphs discuss the results for English and Hebrew together.

Next, the relative amount of narrative information emerged as a function of modality alone, not of age and schooling. Oral narratives are on average longer than written, increasing in length with age, yet they are informationally far less dense: The ratio of narrative to ancillary material is approximately 1:2 in writing versus speech, and this figure holds constant across age groups (Table 2). Within the class of narrative content, by contrast, not modality, but development determines the distribution of types of narrative information. Descriptive units account for approxi-

TABLE 5
 Mean Percentages and Standard Deviations of Disfluency Markers in Spoken Narrative Texts, by Age and Language

| | <i>Grade School</i> | | | | <i>Junior High</i> | | | | <i>High School</i> | | | | <i>Adults</i> | | | |
|--------------------|---------------------|-----------|---------------|-----------|--------------------|-----------|---------------|-----------|--------------------|-----------|---------------|-----------|----------------|-----------|---------------|-----------|
| | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | |
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| Disfluency markers | 97.69 | 3.00 | 98.71 | 3.19 | 95.12 | 5.72 | 96.91 | 7.92 | 92.54 | 6.88 | 92.31 | 6.18 | 85.40 | 15.27 | 86.93 | 12.57 |

mately half the narrative content across modalities and age-groups, Eventives drop from some 50% in grade school to 40% in junior high and less than 30% in the older age groups, whereas interpretives rise from less than 10% in grade school and junior high to around 20% or more in the two older groups.

Third, different types of ancillary material occur differentially in the two modalities. Reiterations, two types of discourse markers (segment taggers and qualifiers), and story-external commentary occur in both modalities, although far less in writing than in speech. Reiterations are 4 times as frequent in speech as in writing, segment taggers are 11 times more frequent, and qualifiers are 7 times more frequent in speech than writing. Together, these three features of the spoken texts make the spoken narratives informationally sparser than their written counterparts. Conversely, segment taggers and qualifiers, but not reiterations, form a U-shaped developmental curve in speech, because the youngest and oldest groups (4th graders and adults) produce far fewer of these two ancillary elements than the adolescents. Story-external commentary, by contrast, rises with age in the spoken texts, particularly among the adults.

Fourth, repairs and discourse markers as a whole are confined to speech. Repairs occur in the spoken texts of Israelis somewhat more than in Californian English. The four types of discourse markers combined form a clear U-shape that peaks in adolescence. Finally, ancillary elements that most markedly diminish informative density in speech—reiterations, repairs, and three types of discourse markers—interactives, segment taggers, and qualifiers—account for most nonnarrative content and decline with age, especially among adults, consistently with other findings for the age-related nature of disfluency (Bortfeld et al., 2001).

Changing Nature of Narrative Content Across Development

Our study enabled us to reevaluate features of narrative content that are typically treated under the headings of narrative “evaluation” or “background” in a fresh, developmentally motivated perspective. A key contribution in this respect is the distinction between the functions of description and interpretation, on the one hand, and the notion of story-external commentary as a self-contained category, on the other. Together, interpretives and story-external commentary embody a developmental shift from “bare-boned” to “fleshed out” stories across adolescence. Moreover, the same clear, age-related elaboration of narrative content is manifested in speech and writing alike. Grade-school stories consist of plot-internal, core eventives plus accompanying descriptives; junior high school sees the emergence of interpretive elements; high school students add interpretation, monitoring, and occasional story-external commentary, while a significant proportion of fully proficient adult narratives contain extensive pieces of story-extraneous, yet referentially informative, material. This fleshing out of narrative information and commentary—irrespective of modality constraints—changes with development in

quality as well as amount. In line with findings from research on preschool and grade school narrative development (Bamberg & Reilly, 1996; Reilly, 1992) and on personal-experience narratives of Hebrew-speaking preadolescents (Segal, 2001), the youngest subjects in our study expressed affective reactions toward the events they recounted rather than interpreting these events cognitively (e.g., a 4th-grade American girl commented, “And I started to cry because I felt bad for my sister”; eG08fns). A slightly more sophisticated view on events is expressed by a junior high school girl who says of her antagonist “And then she was still accusing me of it, and she was getting really annoying” (eJ06fns). A shift to a cognitively more distanced orientation and a greater diversity in types of interpretations of events are the hallmarks of adolescent and adult storytelling. This is demonstrated by the following excerpt from the high school text in Appendix A: “And ever since kindergarten he had been a person who was popular in the class, not because he was someone that everyone loved or really admired, it was because, it was more like because they were afraid of him, and they thought that if they they joined his pack, then it would be um safer for them.” This kind of detached, nonpersonalized commentary typifies our notion of narrative interpretation; such examples are quite common among high school adolescents, but not before. Moreover, at this developmental stage, interpretations are, for the first time, also accompanied by story-external content, as ancillary interpretive commentary—illustrated in the extracts in (4) from the oral narrative of this same high school boy, in which he starts by relating to the textual task at hand and toward the end propounds his view of the world of conflict and his knowledge of human nature in general—again, in the expository-like, timeless present tense.

These changes in the quality of narrative content relate to general cognitive development—in information processing, memory enhancement, and executive control (Flavell, Miller, & Miller, 1993; Kluwe & Logan, 2000), as well as increased moral and social maturity (Kohlberg, 1984; Light & Littleton, 1999). These have a marked affect on developing discourse abilities, as demonstrated independently in a range of current studies (Berman & Katzenberger, 2004; Ravid & Cahana-Amitay, 2005; Reilly, Jisa, Baruch, & Berman, 2002).

These developments result in the richly varied perspectives on events recounted in the spoken and written narratives of our adult population in English and Hebrew, as illustrated by the excerpt in (6), translated from the opening part of a story written by an Israeli woman.

(6) Excerpt from opening segment of story written by an adult (hA01fnw)

There are many cases of disappointment or discontent with the behavior of those around you, surrounding one daily. I generally tend to think a lot before I react to a negative attitude from others, mainly because I don't want to get involved in confrontation, and prefer to live at peace with my surroundings and with myself. Usually

people remember the most recent incidents that they encountered and not something that happened to you in the distant past, unless it is by way of being a trauma that will never be forgotten. What I remember from the past year is ...

A property that particularly differentiates adults' stories from those of children is the shift "from dichotomy to divergence" in distinguishing narrative from expository discourse (Berman & Nir-Sagiv, 2004). The narratives of the high school adolescents and even more so of the adults in our sample contain numerous excerpts such as this, expressing a categorial grasp of situations and a detached stance that is typically associated with abstract expository discourse rather than with personal-experience narratives.

Modality-Driven Differences in Information Density

Interestingly, the overall proportion of narrative information versus ancillary material in written versus spoken narratives remained constant across all four age groups in both languages. We did, however, find several instances of U-shaped developmental curves in the specific *types* of ancillary material that turned out to be more typical of preadolescents and adolescents than of younger or older narrators. This was particularly true for certain classes of discourse markers and is in line with well-documented processes of general socialization and peer-group interactions.

A key finding of our study was that differences in information density are modality dependent from the youngest age group considered here, 9- to 10-year-olds, with no significant age-related differences in this respect. This appears to contradict the complaint often voiced by schoolteachers (at least in Israel) that grade school children write exactly like they speak. However, in fact, our model makes it possible to tease apart two distinct facets of modality effects in narrative production: *processing* versus *expression* of language output. In the current context, *processing* involves the organization and retrieval of verbal information in the course of text production, whereas *expression* concerns the deployment of linguistic forms for the encoding of discourse content. Here, our focus has been on the former, the distinction between online and offline production of verbal material, to which young children and adults alike are similarly susceptible. This explains why so little age-based difference was found for information density in the two modalities.

By contrast, research on narrative development in other cross-linguistic studies (Berman & Slobin, 1994; Hickmann, 2003) demonstrated clearly that linguistic expression changes markedly as a function of age and literacy. In addition, other, linguistically focused analyses of the same database revealed a marked interaction between development and modality, unlike what was found here. Studies of lexical density and syntactic complexity (Berman & Nir-Sagiv, 2004; Ravid, 2004; Strömquist, Johansson, Ragnarsdóttir, Kriz, & Ravid, 2002) revealed considerable development across adolescence in acquisition and use of advanced and literate

language, and with age, this is increasingly deployed in writing as compared with speech. Most pertinent to this study, written and spoken usage have been shown to differ markedly in linguistic register, from formal and monitored via colloquial, everyday to substandard or slang usage for Hebrew (Ravid & Berman, submitted) and in use of high-level Latinate versus everyday Germanic vocabulary in English (Bar-Ilan & Berman, in press). These language-specific analyses also showed a clear interaction between development and modality, in contrast to the bulk of the findings of this study. That is, in linguistic forms and usage, modality effects interact with later language development, demonstrating that from junior high school up, students are able to make use of “written language as a special discourse style” (Ravid & Tolchinsky, 2002).

In conclusion, we return to our claim that information density is critically genre dependent. Further research is needed to test our proposals in relation to nonnarrative discourse, for example, by analysis of spoken and written expository discussion texts produced by the English- and Hebrew-speaking participants of this study. This would require that we establish information units based on types of expository content, as distinct from the eventives, descriptives, and interpretives defined for narratives. Another direction for future study is to explore the hypothesis that material of the type we specified as ancillary—that is, nonnovel or nonreferential—may be largely shared across the two genres. Conversely, it might be that the difficulties inherent in producing expository-type discourse may involve an increase in the relative proportion as well as the internal distribution of such material (Berman & Katzenberger, 2004; Ravid, 2004).

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APPENDIX A

Written Narratives of Four English-Speaking Participants

(1) 4th grader (eG04mnw)

EVENT [I pushed my sister] EVENT [and then I ran]. EVENT [She ran after me].

EVENT [I went to the ground] EVENT [and she kicked me in the mouth.]

EVENT [My mom said] DESCRIPT [we had to go to our rooms for ten minutes]. EVENT [When we came out, we had to say sorry].

(2) 7th grader (eJ05mnw)

DESCRIPT [A kid named Phil and I used to get in a lot of fights and arguments].

EVENT [One day my friends and I doorbell-ditched his house] DESCRIPT [while his grandparents were home]. EVENT [His parents found out] EVENT [and called our parents.] EVENT [Then our parents made us go up and apologize to the grandparents].

(3) 11th grader (eH08mnw)

Not a single life in all of recorded history has been free from obstacles and problems. My own experiences prove that my life is not an exception to this general rule. Throughout my life I have experienced internal conflicts, but I have also had to grapple with problems involving others.

DESCRIPT [At my grade school I had a classmate who was clearly popular INTERPR [because he was feared, not respected or loved] INTERPR [Making my daily life and

those of many others miserable was, as it seemed, the highlight of his existence.]
 DESCRIPT [This classmate, who I had first met in kindergarten] INTERPR [retained his
 malicious streak] DESCRIPT [throughout all of elementary and junior high school
 EVENT [until he witnessed his behavior cause his expulsion from high school].

DESCRIPT [One morning I was standing in the school yard in the company of friends].
 DESCRIPT [While I was enjoying a conversation thoroughly with a friend of mine.]
 EVENT [he appeared.] EVENT [He entered our conversation] INTERPR [as an unwell-
 come intruder] EVENT [and told me to shut up] EVENT [and pushed me] INTERPR [to
 reinforce his message]. INTERPR [While on some days I would have ignored this inci-
 dent,] EVENT [that day I resolved that I would not]. INTERPR [Before fully realizing
 the consequences of what I was doing, EVENT [I thrust my arms forward and returned
 his shove]. INTERPR [As I might have guessed,] EVENT [it did not end there]. INTERPR
 [Filled with a mixture of astonishment and wrath,] EVENT [the classmate kicked me].
 EVENT [Once again I returned his INTERPR[aggressive] act]. DESCRIPT [I was not at
 that point so terribly annoyed at his intrusion into my conversation,] INTERPR [as I
 was attempting to make up for years of such actions.] EVENT [Eventually he was
 pulled away from me,] INTERPR [for surely the faculty knew his temperament and
 could reasonably infer that he was the aggressor.

INTERPR [While it is best, that is more civilized and less violent, to solve conflicts
 with words and compromise, sometimes there is simply no other way.] DESCRIPT
 [From that point on, the problems that he caused me were for the most part verbal]
 DESCRIPT [and even those decreased in time].

(4) Graduate school science major (eA16fnw)

DESCRIPT [At the time of my engagement three years ago, my future in-laws had sev-
 eral INTERPR [preconceived] notions about what the person who was marrying their
 son should be like.] INTERPR [Their preconceived notions about womanhood, about
 being a wife, and existing in general in 1998, were quite different from the standards
 and schema that I followed at that time and today.] INTERPR [This was an inevitable
 source of conflict,] DESCRIPT [resulting in a few harsh words, much hurt, and a great
 deal of tension].

DESCRIPT [Although throughout those first months of my marriage this conflict
 seemed unsolvable,] EVENT [things did get better]. EVENT [What abated the conflict]
 INTERPR [was the difficult but genuine open communication between my in-laws and
 me about what our varying perspectives on these issues were.] EVENT [We came to an
 agreement] DESCRIPT [that their standards should not be imposed upon me], DESCRIPT
 [and I would not or try not to judge them as lesser of people because their schemas
 were different than mine.] INTERPR [This open communication and honesty forced a
 bit of perspective-taking to occur]. EVENT [and illuminated a path to resolution].

APPENDIX B

TABLE B1
Coding Sheet: Information Density

Language: Eng
Grade: H
Medium: Sp
Participant ID: eH08mnsb

eH08fnsb

| | | | |
|------------------|----------------------|----------------|---|
| No. of clauses | 51 | | |
| No. of INFUs | | | |
| | No. of Eventives | 11111111 | 2,18,23-24,25-26,27,28,35,36 |
| | No. of Descriptives | 111111111 | 1,3,4-5,15,16,29-30,31,32,37-38 |
| | No. of Interpretives | 11111111 | 6-7,10-11,12-14,17,19-21,22,32-33,40-43 |
| No. of Ancillary | 1 Reits | 111 | 8,19,20-22 |
| | 2 | 11111111111111 | 3,5, 9,15,16,17,18,28,31,32,40,41,43 |
| | Collaterals=Repairs | | |
| | 3 DMs | | |
| 3.1 | Interactive | 11 | 22,29 |
| 3.2 | Segment Tagger | 1 | 50-51 |
| 3.3 | Qualifier | 11111 | 15,28,29,32,39 |
| 3.4 | Monitor | | |
| | 4 Story-External | 111 | 39,44-47,48-49 |

Note. Eng = English; H = high school; Sp = spoken; ID = text name; INFU = information unit; DM = discourse marker.

TABLE B2
Coding Sheet: Information Density

Language: Eng
Grade: H
Medium: Wr
Subject ID: eH08mnwb

eH08fnwb

| | | | |
|------------------|-----------------------|----------------|---|
| No. of clauses | 51 | | |
| No. of INFUs | | | |
| | No. of Eventives | 111111111 | 17,21,22,23-24,25,32-33,36,38,42 |
| | No. of Descriptives | 11111111111111 | 7-8,12,15,18,19,20,26,28-29,30-31,35,37,40-41,49-51 |
| | No. of Interpretives | 11111111 | 9-11,13,16,22,27,28,39,43-45 |
| No. of Ancillary | 1 Reits | | |
| | 2 Collaterals=Repairs | | |
| | 3 DMs | | |
| 3.1 | Interactive | | |
| 3.2 | Segment Tagger | | |
| 3.3 | Qualifier | | |
| 3.4 | Monitor | 1 | 14 |
| | 4 Story-External | 111111 | 1,2-3,4,5-6,34-35,46-48 |

Note. Eng = English; H = high school; Wr = written; ID = text name; INFU = information unit; DM = discourse marker.

APPENDIX C

TABLE C1
Mean Percentages and Standard Deviations of Eventive, Descriptive, and Interpretive Units of Narrative Information
by Modality, Age, and Language

| | <i>Grade School</i> | | | | <i>Junior High</i> | | | | <i>High School</i> | | | | <i>Adults</i> | | | |
|--------------------|---------------------|-----------|---------------|-----------|--------------------|-----------|---------------|-----------|--------------------|-----------|---------------|-----------|----------------|-----------|---------------|-----------|
| | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | | <i>English</i> | | <i>Hebrew</i> | |
| | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> | <i>M</i> | <i>SD</i> |
| Spoken narratives | | | | | | | | | | | | | | | | |
| Eventives | 52.17 | 16.72 | 42.91 | 23.52 | 39.66 | 15.18 | 38.26 | 15.29 | 29.32 | 15.27 | 22.98 | 23.56 | 27.5 | 11.45 | 30.19 | 10.50 |
| Descriptives | 45.74 | 17.42 | 53.46 | 24.10 | 55.40 | 13.10 | 50.48 | 12.21 | 55.26 | 13.22 | 50.78 | 14.16 | 46.85 | 9.77 | 51.26 | 8.07 |
| Interpretives | 2.08 | 3.59 | 3.64 | 5.68 | 4.94 | 4.07 | 11.26 | 12.33 | 15.41 | 13.95 | 19.24 | 16.32 | 25.65 | 13.50 | 18.54 | 10.71 |
| Written narratives | | | | | | | | | | | | | | | | |
| Eventives | 64.62 | 12.89 | 54.27 | 27.39 | 41.29 | 24.85 | 38.05 | 12.54 | 29.01 | 15.95 | 27.10 | 17.76 | 29.70 | 10.27 | 28.20 | 16.76 |
| Descriptives | 33.94 | 12.52 | 42.39 | 25.55 | 49.73 | 17.71 | 52.83 | 16.87 | 49.63 | 9.44 | 55.84 | 13.88 | 43.31 | 8.33 | 50.89 | 17.73 |
| Interpretives | 1.41 | 2.97 | 3.34 | 5.53 | 8.97 | 10.00 | 9.12 | 9.25 | 21.36 | 14.96 | 17.06 | 12.47 | 26.99 | 8.95 | 20.91 | 7.06 |