The role of reception and production modalities in discourse comprehension: a study on early interactions in primary school children

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The aim of this work is to study the role of reception modalities (listening / reading) and production (speaking / writing) of language in child´s 3rd grade, 49 girls and 49 boys (average age: 8.2 years). We used two types of measurement: microproposicional analysis of text and story grammar analysis. In micropropositional analysis, results showed significant differences and interactions such between conditions, both reception (listening and reading) as in production (speaking and writing). Oral communication (listening and speaking) facilitated the identification of the main ideas while is written communication (reading and writing) facilitated memory strategies. Analysis from the grammar of stories showed no significant differences between modalities and interactions between them: the structural organization and the type of propositions recalled were very similar in the four conditions.

Keywords: Listening, reading, speaking, writing, reading comprehension.

El papel de las modalidades de recepción y producción en la comprensión del discurso: Un estudio sobre sus interacciones en alumnado de Educación Primaria. El objetivo de este trabajo es estudiar el papel que desempeñan las modalidades de recepción (escucha/lectura) y de producción (habla/escritura) del lenguaje en niños de 3º de Primaria, 49 niñas y 49 niños, (media de edad: 8.2 años). Se utilizaron dos tipos de medida: el análisis microproposicional del texto y el análisis de gramática de cuentos. En el análisis microproposicional, los resultados mostraron diferencias significativas y las interacciones tanto entre las condiciones de recepción (escucha y lectura) como en las de producción (habla y escritura). La comunicación oral (escuchar y hablar) facilitó la identificación de las ideas principales (se generaron más macrorreglas), mientras que la comunicación escrita (lectura y escritura) facilitó las estrategias memorísticas (recuerdo literal). Por su parte, los análisis a partir de la gramática de historias no mostraron diferencias significativas entre las modalidades ni interacciones entre ellas: la organización estructural y el tipo de proposiciones recordaron fueron muy similares en las cuatro condiciones.

Palabras clave: Escucha, lectura, habla, escritura, comprensión lectora.

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This work tries to analyze the representation of a narrative text of children from 3rd Grade (about 8-years-old) as a result of different acquisition (listening/reading) and production (speaking/writing) modalities.

Listening and Reading Relationship

The relationship between listening and reading activities, has, during years, focused on the written text, and has generally assumed that the processes involved in the reading modality were also those involved in the auditory modality. In this context, one view is that listening and reading language comprehension represent essentially the same process: reading a word simply involves decoding the orthographic symbols to a phonetic representation (Fleischman, 1991). So the traditional models on text comprehension (e.g., Hawkins, Musti-Rao, Hale, and McGuine-Hailley, 2010; Thompson and Rubin, 1996) considered the existence of the same processes of acquisition of comprehension in both modalities of receipt of written language.

The traditional alternative point of view was that although the two processes share significant subparts (Stothard and Hulme, 1992; Vandergrift, 2002). These researchers argue that demands on syntactic structure are more sophisticated in reading tasks than in listening tasks, and that while the syntactic structure of a spoken sentence is given to the listener through prosodic cues, the syntactic structure of a written sentence must be discovered by the reader (who can look back, rereading a misparsed sentence or an entire paragraph because the written text is permanent).

However, recently, the research has analyzed data, with the aim of evaluating the relationship between listening processing and reading in reading comprehension tasks show that novelty subjects in a reading situation made greater use of the semantic processing of the text than the subjects who listened (Vidal, 2011; Wolf, Muijselaar, Boonstra, and de Bree, 2019). But nevertheless, Kim, Park, and Wagner (2014) ot Owolewa and Oyewole (2017) found, for first grade students, that listening comprehension dominated relationships.

Speaking and Writing Relationship

The type of relationship between spoken and written production, has also been in question for a long time in the literature. Often this relationship has been described as one of primacy of spoken language over written language: written language production was commonly assumed to depend on spoken language, both developmentally and structurally (Mason and Bascolo, 2000; Rijlaarsdam, van-den-Bergh, and Zwarts, 1992).

In other cases, spoken and written discourses were thought to be separate systems, each with its own syntactic, semantic and pragmatic rules (Bekerian and Dennett, 1990; Bibar, Conrad, Reppen, Byrd, and Het, 2002; Bloome, 2006; Dannes, 1994; Gillam and Johnston, 1992; McCutchen, Covill, Hoyne, and Mildes, 1994;

Sindoni, 2014; Sorrell, 1991; Stout, 1992). The debate concerning the pragmatic differences between spoken and written discourse has been centered on two related issues: contextual sensibility and speaker/writer involvement. In this way, the standard view (e.g. Olson, 1977) supports that the spoken language (which Olson called "utterance") is substantially different in both its structure and function from the written language (which he also called "text"). Spoken language is specialized for social situations and is a form of communication based on shared representations between the speaker and the listener. Spoken language also places significant demands on memory and may require special strategies to recover information. Written language, on the other hand, does not require specialized mnemonic devices as the continual presence of the written word greatly reduces memory load and makes repeated scanning possible (Arias-Gundín and Fidalgo, 2017).

However, some works in written and spoken language development have adopted a different position that refutes both the primacy and the separate systems arguments. Researchers as Lowe and Brock (1994); Moorman, Blanton, and McLaughlin (1992), Vieiro and García-Madruga (1996), Willimas,Stathis and Gotsch (2008); Berninger et al. (2010). Do not view both types of communication as opposites and structurally unrelated, each with its own exclusive and static characteristics; but rather consider them as alternative modalities on a single communicative continuum. In fact, they consider that the structural differences between oral and written language are determinated by the different communicative functions that their various forms (e.g. narrative, expository text, lecture, informal conversation) serve in different situations. For this reason, we are interested in what happen when one discourse genre, for example, narratives, is compared across written and spoken modalities?. The study reported in this paper was an attempt to investigate this question.

Besides, we argue that oral and written communication must be separate in its acquisition and production dimensions according to the different communicative contexts (oral acquisition, oral production/written acquisition, written production), giving rise to four different textual processing.

Research questions

In this context, we are interested in what happen when one discourse genre, for example, narratives, is compared across written and spoken modalities. The study reported in this paper was an attempt to investigate this question.

We argue that oral and written communication must be separate in their acquisition and production dimensions according to the different communicative contexts (oral acquisition, oral production/written acquisition, written production), giving rise to four different textual processing.

These differences, in narrative contexts, must be shown on several measures, especially those which deal with comprehension strategies (Kintsch and van Dijk, 1978; Kök, 2018; Verhoeven and Perfetti, 2008; Wilkie, 2002) and discourse schemata (Thorndyke, 1977).

We maintain that the structural and functional differences between both acquisition and production modalities produce different types of macropropositional representations in reading comprehension stories which are independent of story grammar knowledge, because this knowledge is a previous ability to reading and listening acquisition, such as Silva y Cain (2015) supports. Macro-structures have been postulated in order to account forthe 'global meaning' of discourse such as it is intuitively assigned in terms of the'topic' or 'theme' of a discourse or conversation.

Significant differences and interactions between the four experimental situations:

We expected differences in favour of reading and writing conditions in Recall (about literal information) and Omissions (about literal information); and in favour of listening and speaking conditions in Addition (prior knowledge, information consistent with the text) and Confusion (prior knowledge information not consistent with the text) and use of Macrorules_ strategies to identify the main idea_ (construction, generalization, selection and elimination about textual information).

We do not expect significant differences and interactions between listening, reading, speaking and writing conditions in superstructure recall_ text organization strategies_ (Frame, Theme, Plot and Resolution recall) and in the recall of the different propositions concerning Action, Event, Desired State, Real State, Goal, Subgoal.

METHOD

Subjects

Data were collected within the context of a study into reading and writing ability according to two situations of reception of the text (reading / listening) in primary education in Spain. Ninety-eight Spanish 3rd grade children, 49 girls and 49 boys (mean age = 8.2 years; SD=0,7), were recruited. Students in the study were randomly sampled and distrubuted into four groups composed acording to the four experimental situations. None of the children had diagnosed developmental disabilities or sensory impairments at the beginning of the study. Informed consent for the children to participate was obtained from their parents.

Materials

One long narrative was selected for the study. The story "The Lion and the mosquito"was taken from an spanish textbook that is adopted in spanish schools for

3rdgrade students. Teachers at the school considered the reading text appropriate for all levels regarding the number of new vocabulary words and the language structure. All levels of students used the same reading texts and worksheets.

The text used to measure reading comprehension: consisted of a sequence of episodes, each episode had the same internal structure, denoted by the terms Frame, Theme, Plot and Resolution. Each of the Plots consisted of four Episodes (see Appendix I).

The context and the characters of the text were familiar to children. At the same time, the argument was appealing, because it described the animal world, a common topic in children´s stories because the texts had a structure similar to that presented in the textbook readings (see Appendix I).

We divided the sample of subjects into four groups: G1: they listened to the story read by an adult and summarized it orally; G2: they listened to the text and summarized it in writing, G3: they read the text and summarized it orally; G4: they listened to the story and summarized it in written form.

Design and Procedure

In order to analyze the influence of reception and production modality on the summaries, an intersubjects 2 x 2 design was used: acquisition modality factor (listening/reading) and production m odality factor (speaking/writing).

The levels of the independent variables were determined by the acquisition and production modalities (listening, reading, speaking and writing). Two measures were used as dependent variables: one of these measures was based on Kintsch's propositional analysis (Literal Recall, Omissions, Aditions, Confusions and Macrorules); and, the other measure was the narrative schemata for the text category of the story and for the type of proposition recalled (Thorndyke, 1977). In writing a summary and reflection, students were guided to organize their writing in three parts_frame, theme, plot, and resolution_.

In the G1 condition (listening/speaking), subjects listened to a tape recording of the story. The tape was prepared by a male with recording experience. When subjects had listened to the story, they were asked to give a summary of it. Further prompting was given (e.g., "Go on") when children paused or hesitated. When the child appeared to have finished, he was asked the final probe, "Can you remember anything else that happened?".

In the G2 condition (listening/writing) the procedure was the same in all important respects to the listening condition (G1), except that the subjects were asked to write a summary of the story.

In the G3 condition (reading/speaking), subjects were given a typewritten copy of the story to read at their own pace. The instructions for reading were as follows:

"please, read the whole story through first, and do not go back to the story". The instructions in the summary were the same as G1.

In the G4 condition (reading/writing), subjects were given a typewritten copy of the story to read at their own pace. When they had read the story, they were asked to write a summary of it. The complete instructions given were the same as G2.

Scoring

The summaries were compared along the following dimensions:

First, the texts were divided into propositions as defined by Kintsch and van Dijk (1978) for the purpose of comparing them to the children's retelling of the story and knowledge of the strategies used in comprehension. This model is an example of discourse analysis that focuses on the semantic relationships within an idea unit, while the overall organization of the passage is not fully examined.

We coded the different propositions in the retelling as:

Literal Recall (essentially complete and accurate); *Omissions* (all elements of the propositions were missing), two types of *Distortions* (additions as an incorporation of inconsistent information with the story, and *Confusions* as inconsistent relations between the propositions of the story, e.g., confusion of characters' actions); and the four types of Macrorules: a) *Deletion Macrorules* are when subjects delete all those propositions from the text base which are not relevant to the interpretation of the other propositions of the discourse; b) *Integration Macrorules* are when subjects select from a text base all propositions which are interpretation conditions, presuppositions, or of other propositions in the text base; c) *Generalization Macrorules* are when subjects do not simply leave out globally irrelevant propositions which detract from semantic detail in the respective sentences but construct a proposition that is conceptually more general; and d) *Construction Macrorules* are when the propositions, are seen to be "taken together" by substituting them, as a joint sequence, with a proposition that denotes a global fact of which the micropropositions denote normal components or consequences. The recall protocols were scored according to how they compared with the micropropositions of the base text.

Secondly, the text was divided into propositions as defined by a story grammar. Story grammars are often interpreted as representations of individuals' expectations of structures in stories. The Thorndyke Grammar was used in the present study to represent the set of expectations readers might have for story structures. The grammar consists of a set of definitions of the major story components and phrase-structure rules which delineate ways that components may be combined. Briefly, the major story components described by Thorndyke (1977) are: Frame, Theme, Plot and Resolution. The structure of these episodes makes up the schemata of the text. Thus, we coded the different propositions in the retelling task as Categories (Frame, Theme, Plot

and Resolution) and types of propositions recalled (Action, Event, Real State, Desired State, Goal and Subgoal):

-Frame: the temporal and spacial frame of the story.

-Theme: the central part of the story, describing the characters' aims.

-Plot: includes several episodes.

-Resolution: includes the end of the story (see Appendix II, examples of all categories).

-Actions: propositions, which express movement (e.g., "the mosquito took a run-up").

-Events: propositions, which describe a situation (e.g. "he went on: you deserve a lesson, my friend").

-Real State: propositions, which refer to a character's present state (e.g., there was a very conceited lion").

-Desired State: propositions which refer to states which the character would like to obtain (e.g., "And, therefore, did not let/ anybody come close to him").

-Goal: propositions, which express the desired result of an action (e.g., "I would like to show you which of us is the stringer").

-Subgoal: propositions, which express the reason for the beginning of an episode (e.g., "he went on: you deserve a lesson, my friend").

RESULTS

All protocols were scored independently by two raters. The correlations between raters' scores were high (all above $r=.96$).

Table 1. Means corresponding to micropropositional analysis

	Listening		Reading	
	G1 Speaking	G2 Writing	G3 Speaking	G4 Writing
Recall	0.17	0.24	0.26	0.49
Ommision	0.28	0.40	0.49	0.37
Addition	0.26	0.12	0.10	0.03
Confusion	0.08	0.06	0.04	0.01
Generalization	0.09	0.06	0.01	0.01
Construction	0.12	0.02	0.04	0.01
Integration	0.02	0.01	0.01	0.01
Delete	0.11	0.05	0.01	0.01

Note. Maximum score in micropropositional análisis: 113

The mean indices of the different measures of the dependent variables are given in tables 1 and 2. The results clearly show that: (a) summaries from G4 (reading and wrinting) are the most literal; (b) summaries from G3 (reading and speaking) show more omissions; (c) there are more macrorules and inferences (additions) of the original

text in G1 (listening and speaking) although these summaries show more distortions however the proportion of this measure is very low; (d) grammar measures were less affected than micropropositional measures by the communication type, only measures of Frame show that the G1 (listening and speaking) and G3 (reading and speaking) had higher scores.

Table 2. Means corresponding to Grammar analysis

| | Listening | | Reading | |
	G1 speaking	G2 Writing	G3 Speaking	G4 Writing
Frame	2	1	2	1
Theme	0	0	0	0
Plot	17	16	16	28
Resolution	1	1	1	1
Actions	7	7	7	7
Events	7	8	7	7
Real states	2	1	1	1
Desired states	2	2	2	2
Goals	1	1	2	1
Subgoals	1	1	1	0

Note. Maximum score in each category recalled: F= 2; T= 3; P= 33; R=4// Maximum score in each type of proposition recalled: A=13; E=10 RS=4; DS=5 G=5 SG=5

Data Analysis

A) Micropropositional Data

A 2 x 2 MANOVA of the total accuracy score in micropropositional analysis was performed to test our first hypothesis. It revealed the following main effects of the two factors:

a) the acquisition modality factor was significant in the Recall, Omission, Addition and Generalization, Construction and Deletion Macrorules;

b) the production modality was significant in the Recall, Addition and, Construction and Deletion Macrorules;

c) interaction acquisition modality by production modality showed significant differences in the Recall, Omission, Addition, Confusion and Generalization, Construction and Deletion Macrorules (see Table 3).

To determine which summary conditions differed, several Scheffè contrasts, at the 0.05 level, were conducted. Contrast revealed that while the reading condition provides significant differences in Literal Recall *(p= .01)* and Omissions (p = .03), the listening condition provides the use significant use of Generalization (p= .03), Construction (p= .02) and Deletion (p= .02) Macrorules and at the same time produces more Additions (p= .02). Secondly, we found that while writing condition favours the Literal Recall (p = .01), the speaking condition favours the use of Additions (p= .02) and, Construction (p = .03) and Deletion (p=.,04) Macrorules

B) Story Grammar Data

- Categories Data

A 2 x 2 MANOVA of the total accuracy score in category type recalled was performed to test our second hypothesis. Results of acquisition and production modality factors did not show significant differences in the four dependent variables (see Table 4).

Table 3. MANOVAs for micropropositional analyses

Source of variation	Df	F-ratio
Recall		
Main effects	2	356.789**
Acquisition	1	323.456**
Production	1	301.444**
Interactions	1	298.245**
Omission		
Main effects	2	134.965*
Acquisition	1	112.765*
Production	1	150.065
Interactions	1	180.876*
Addition		
Main effects	2	121.121
Acquisition	1	100.654
Production	1	198.654
Interactions	1	210.123
Confusion		
Main effects	2	99.234
Acquisition	1	80.422
Production	1	94.567
Interactions	1	107.633
Generalization macrorules		
Main effects	2	95.098*
Acquisition	1	109.456*
Production	1	127.765
Interactions	1	159.123*
Construction marorules		
Main effects	2	103.098*
Acquisition	1	110.543*
Production	1	205.987*
Interactions	1	134.654*
Deletion marorules		
Main effects	2	101.234*
Acquisition	1	134.234*
Production	1	124.450*
Interactions	1	111.229*
Integration macrorules		
Main effects	2	90.324
Acquisition	1	86.654
Production	1	92.768
Interactions	1	75.766

*p<.05 **p<.01

- Type of proposition Data

A second 2 x 2 MANOVA of the total accuracy score in type of proposition recalled was performed to test our second objective. Results of acquisition and production modality factors did not show significant differences in the four dependent variables recalled.

Table 4. MANOVAs for story grammar analyses
(type of Category and Proposition recalled)

Source of variation	df	F-ratio
Frame		
Main effects	2	79.445
Acquisition	1	109.23
Production	1	40.543
Interactions	1	47.234
Theme		
Main effects	2	60.876
Acquisition	1	50.876
Production	1	54.345
Interactions	1	62.568
Plot		
Main effects	2	40.776
Acquisition	1	13.567
Production	1	60.238
Interactions	1	34.856
Resolution		
Main effects	2	18.346
Acquisition	1	32.557
Production	1	6.432
Interactions	1	8.679
Actions		
Main effects	2	9.001
Acquisition	1	12.678
Production	1	2.456
Interactions	1	31.344
Events		
Main effects	2	24.450
Acquisition	1	23.467
Production	1	40.455
Interactions	1	130.446
Real states		
Main effects	2	4.123
Acquisition	1	4.234
Production	1	5.456
Interactions	1	.987
Desired states		
Main effects	2	5.441
Acquisition	1	9.011
Production	1	3.845
Interactions	1	.156
Goals		
Main effects	2	5.443
Acquisition	1	16.455
Production	1	.154
Interactions	1	.109
Subgoals		
Main effects	2	5.876
Acquisition	1	9.990
Production	1	.112
Interactions	1	.143

$*p<.05 **p<.01$

DISCUSSION/CONCLUSIONS

The findings of the present study support the following major conclusions:

Firstly, our results have shown that while the micropropositional analysis is a powerful indicator of differences and interactions between acquisition and production modalities, the story grammar measures did not reveal such differences and interactions.

Secondly, we found interactions between acquisition and production modalities in the use of comprehension strategies. These modalities showed an important

influence on the cognitive processes involved in narrative text comprehension: while the reading and writing condition provided the Literal Recall and decreased the number of Additions and Confusions, the hearing and speaking condition provided the use of Macrorules, Additions and Confusions. The presence of these pronounced differences and interactions lends some support to the theoretical position discussed in the introduction to this article and maintained by researchers like Rubin (1980); Carlisle and Felbinger (1991), Stothard and Hulme (1992); Nichols (1995) or Ledetfein et al. (1998): oral and written communication involve different comprehension skills.

In accordance with Rubin (1980), Frankel (1989) or Bedford, Geiger, Moyse, and Turner (1995) the reason for these differences must be the permanence of text inherent in reading and writing situations. Reading and writing situations allow for much deliberation, and readers and writers can proceed at their own pace and even retrieve previously written information. Furthermore, they have free access to the text, which can provide a style characterized by the use of "copy-delete" strategies. Contrary, the attentional and working memory demand imposed on the listener by the hearing situation and on the speaker by the speech situation (they cannot look back to check a specific point or answer a specific question) can provide the use of Macrorules.

At the same time, Rubin argues the differences between both modalities must be due to frequency of oral language experiences in early school-aged children. These experiences can permit the production of inferences and resolve lexical ambiguities and nominal or pronominal references, providing the use of Macrorules in oral summaries. In contrast, reading and writing activities are closely connected with curricular activities and are learned at a later age.

Thirdly, we have argued that the role of discourse schemata on acquisition and production is to integrate and organize the textual information.The finding that the structural organization of written communication (reading and writing condition) was essentially identical to that of the spoken communication (listening and speaking condition) appears to support the hypothesis that the same discourse scheme is used to guide listening, reading, speaking and writing productions. Our summaries were very close in the narrative productions, which indicates that they can be characterized by a "grammar" although that grammar did not appear very specialized. An interesting finding was the imbalance between the recalled parts of the story. Subjects devoted a considerably larger portion of their summaries to the Frame and to the Resolution recalled (first and last quarter of each story) than to any of the remaining quarters (for example they did not recall the Theme). On the other hand, children did not recall propositions, which referred to characters' Goals and Internal States; which can be due, as as Flavell (1976) points out, that the greatest part of memory process control occurs

about 11 years old; or as Vauras, Kinnunen and Kuusela (1994) argues, that the most critical development from age 9 onward took place in local- and global-level processing.

The importance of our research is that this pattern of results appears in both communication modalities. Therefore, it permits us to make the suggestion that the initial composition of the discourse is guided by an organizational schema which is modality independent.

These results are supported by Nicholson and Whyte (1992), Rousseau, Tam, and Ramnarain (1993), Robbins and Ehri (1994), Smyth and Scholey (1994), Mahiri (1996) Schultz (2003) or Corkery (2005) who argue that differences between oral and written communication occur with respect to the number of words produced (oral longer than written), to the cohesion (written productions are more cohesive than the oral productions) but, they do not occur with respect to the organizational structure, because in writing story production, the structural elements of the story (frame, theme, plot, resolution...) serve as "cues", in place of the conversational partners, providing the children's productions.

In sum, our results show that the differences and interactions between the two modalities seem to be more closely related to the processing characteristics of both modalities than to the structural recall, at least under the present study conditions. We would expect that these differences were found in several measures, especially in those which deal with processing strategies and structural recall. But, as we have previously stated, the data only showed significant differences in the way of discourse processing. Subjects used different processes in comprehension at microstructural and macrostructural levels depending on the demand tasks (oral or written presentation, oral or written production) used, which allow us to characterize four different ways of discourse processing (basically due to the structural characteristics of text and voice and to the retoric demands of speaking and writing).

Perhaps, these results suggest that having students engage in reading, writing, speaking, and listening tasks and in explicit writing instruction and production during a reading comprehension unit facilitates their content knowledge acquisition, improves the overall quality of students' argumentative writing, and more specifically, improves the organization and development of that writing. It is recommended that further research be conducted to determine the best way to group students for collaboration when incorporating reading, writing, speaking, and listening tasks within content area instruction.

Results of this work must be interpreted within the limitation of the sample and of the educational level studied. However, it has important educational implications regarding the influence of the modality of reception and production of discourse as a facilitator of text comprehension.

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