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Further evidence of poor comprehenders' difficulty with expressive writing: Exploring the role of inferences



Anna Maria Re^a, Barbara Carretti^{b,*}

^a Department of Developmental Psychology and Socialization, University of Padova, Italy

^b Department of General Psychology, University of Padova, Italy

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ABSTRACT

Several studies have demonstrated that children with poor reading comprehension abilities have weak expressive writing skills too. The aim of the present research was to establish whether poor comprehenders' low performance in expressive writing is mediated by the need to produce relevant inferences to construct the narrative. To do so, we compared two conditions: in one, the children's comprehension of the story relied partly on their ability to draw crucial causal inferences; in the other, all the information needed to follow the sequence of events was provided in pictures.

Irrespective of the condition, poor comprehenders (aged 8–10 years) produced less effective written texts. Analyzing the use of connectives shed some light on the characteristics of the poor comprehenders' written narratives, which seemed to be less cohesive. The poor comprehenders tended to use more additive connectives than causal connectives, which is why their texts resembled a list of events with a description of each picture.

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1. Introduction

Telling a story in written or oral form is a cognitively complex matter, and numerous abilities are involved in the process of expressive writing. Classical studies on expressive writing (Burnett & Kastman, 1997; Hayes & Flower, 1980) have shown the importance of context and long-term memory, and particularly of a number of cognitive processes that include planning, transcription and revision. Writing an essay involves not only producing ideas adequately, but also organizing them consistently with the task's objectives. So cognitive and metacognitive abilities are involved.

A good narrative requires a coherent and cohesive organization of the events being narrated. In particular, coherence refers to the ability to structure information so that the whole sequence of events is interrelated in a meaningful way. This may be accomplished by accessing schematic information that defines a set of rules governing the organization of the content of a story as regulated by story grammar (e.g. Shapiro & Hudson, 1997). A story's cohesion, on the other hand, relies on the use of linguistic devices, such as connectives, that enable a series of sentences to be connected together to form a whole (e.g. Shapiro & Hudson, 1997). The quality of written vocabulary knowledge is another aspect related to narrative writing skills (e.g. Olinghouse & Leaird, 2009).

Several studies have demonstrated a two-way relationship between the ability to understand texts and the ability to write narratives (see, for example, Abbott, Berninger, & Fayol, 2010), but reading comprehension predicts the quality of

* Corresponding author.

E-mail address: barbara.carretti@unipd.it (B. Carretti).

written expression better than other language skills such as listening comprehension or oral expression. This would mean that writing skills are influenced differently by comprehension of the written as opposed to the spoken word. This pattern of relationships has been found, with few exceptions, for schoolchildren from 3rd to 7th grade. The importance of reading comprehension for the development of good written composition skills was also confirmed in a longitudinal study by [Abbott et al. \(2010\)](#), who found that text comprehension ability had significant longitudinal paths to text composition in children in Grades 2 to 6.

On the basis of these data, we might expect the complexity of expressive writing to pose a number of difficulties for any child, but even more for children who have problems with the underlying processes ([Berninger & Rutberg, 1992](#); [Hooper, 2002](#)), such as children with comprehension difficulties. These “poor comprehenders” are characterized by a significantly worse than normal comprehension performance despite adequate reading decoding and nonverbal abilities (see [Hulme & Snowling, 2009](#)). A weak performance in the semantic components of language is associated with difficulties in different academic learning processes. In the case of writing skills, for instance, there is evidence to suggest that poor comprehenders generally produce a narrative comparable with that of good comprehenders in terms of the length of the text and spelling errors, but the content of their text is less coherent and consistent (e.g. [Cragg & Nation, 2006](#)). This situation, particularly as concerns the coherence and consistency of narratives, is also seen when poor comprehenders are asked to give an oral account of a story (e.g. [Cain, 2003](#); [Cain & Oakhill, 1996](#); [Carretti, Motta, & Re, 2014](#)), so their difficulties are apparently not specific to the written format. Some results (that have yet to be replicated) suggest that poor comprehenders’ expressive writing difficulties only apply to narratives. For example, [Carretti, Re, and Arfé \(2013\)](#) compared the writing skills of good and poor comprehenders in two expressive writing tasks, one that involved writing a narrative text and the other providing a description, both using a pictorial prompt. Their results showed that the poor comprehenders performed adequately, and no differently from the good comprehenders, when the task only involved describing the content of a picture, but in the narrative task they had more difficulty in organizing and communicating their story, even though they could refer to the picture. The situation was the same both when children had to organize a narrative on the basis of a set of pictures, and when they had to write about a familiar event starting from a verbal prompt (a title). These findings suggest that narrative writing per se is particularly challenging for poor comprehenders. The prompt used by [Carretti et al. \(2013\)](#) to elicit descriptions differs from those commonly used to produce a narrative, however, in that it consisted of only one picture, which contained all the elements to include in the description, whereas several cartoons are usually presented in narrative writing tasks. To understand the story, the information contained in each cartoon might need to be identified, integrated and sometimes used to infer connections between the pictures. The prompt used to produce narrative texts is therefore presumably intrinsically more complex because of the need to infer content that is not explicitly displayed (in the study by [Carretti et al., 2013](#), at least).

To clarify this issue, the aim of the present study was to compare two conditions: in one, the causal links between a series of cartoons have to be inferred; in the other, a second series of pictures illustrates a linear story with no need for causal inferences to develop a coherent story. The materials were adapted from previous studies on the topic, and particularly those by [Carretti et al. \(2013\)](#), and [Carretti et al. \(2014\)](#), following the study by [Shapiro and Hudson \(1991\)](#), who manipulated the characteristics of visual prompt. In one series of pictures, there were a problem-solving sequence embedded in the sequence of events that implied the need to infer causal links between the events. In other words, participants had to identify the causal events that enable the different events depicted in the pictures to be connected. In the case of the “bird story” (see panel A of [Fig. 1](#)), for example, participants had to infer that the child fell down because the branch of the tree broke, and that the child was afterwards admitted to hospital with a broken leg. In the other, event-based version of the pictures, there were no embedded problem-solving sequences and the narratives could simply consist of a description of the events. It is worth noting that some inferences needed to be drawn in the event-based condition too, but there was no core event to identify.

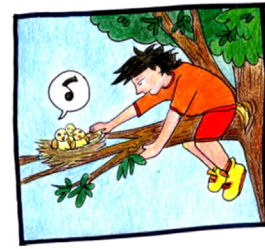
Using a series of cartoons that depict the whole story, with no need to infer the causal information within the sequence of events, could prove an advantage for poor comprehenders, enabling them to use local cohesive devices such as connectives more easily. In the standard pictorial format, which involves inferring intervening events, we would instead expect to see poor comprehenders producing less cohesive and coherent texts due to their already-reported difficulties.

2. Method

2.1. Participants

This study involved 18 poor comprehenders (10 males and 8 females), aged 8–10 years, and 18 good comprehenders (10 males and 8 females), matched for school grade and type of school. The children were selected from an original sample of 248 children (129 males and 119 females) attending the fourth and fifth grades (mean age = 9.59 years, SD = 0.54). All children came from families with Italian as their first language, children with intellectual disabilities or with Italian as their second language were excluded. The two groups were selected on the grounds of the general criteria proposed by [Cornoldi, De Beni, and Pazzaglia \(1996\)](#), and were matched for estimated IQ by collectively administering the spatial relations subscale of the Primary Mental Abilities test (PMA, [Thurstone & Thurstone, 1963](#)), and individually administering the Colored Progressive Matrices ([Raven, Raven, & Court, 1998](#)). In the spatial relations subscale of the PMA, the task involves choosing one of four figures that can be combined with a given figure to produce a square; the task consists of 25 items and must be completed in 6 min. The vocabulary subtest of the PMA battery was also administered to estimate participants’ vocabulary knowledge.

Panel A



Panel B



Fig. 1. Example of cartoon strips in the two conditions (panel A with inference, panel B without inference).

The children's reading decoding abilities were estimated first by collectively administering a lexical decision task (Caldarola, Perini, & Cornoldi, 2012), and then individually administering a test of nonword reading taken from an Italian battery for assessing dyslexia (Sartori, Job, & Tressoldi, 2007). The Lexical Decision task (Caldarola et al., 2012) involves silently reading a list of words and nonwords, and identifying the words as rapidly as possible. A nonword writing task was also administered, again drawn from the battery of tasks developed by Sartori et al. (2007).

The two groups in our study differed in a standardized reading comprehension test appropriate for their grade, the MT test (Cornoldi & Colpo, 2011), with poor comprehenders obtaining scores below the 15th percentile, while good comprehenders obtained scores above the 50th percentile (see Table 1).

Table 1
Description of the sample by group.

N	Good comprehenders		Poor comprehenders	
	18		18	
	M	SD	M	SD
Age	9.44	0.62	9.72	0.83
Reading comprehension	11.56	0.98	5.72	0.96
Raven's CPM (correct answers)	26.50	4.09	24.50	4.25
PMA Spatial abilities	12.11	3.56	11.22	3.02
Lexical decision task	36.89	9.65	37.28	11.22
Nonword reading (syllables per second)	2.29	0.58	2.18	0.56
Nonword reading (errors)	2.39	2.03	2.72	2.16
Nonword writing (errors)	2.56	2.50	3.61	2.09
PMA Vocabulary	19.78	8.40	15.72	8.06

The collective session lasted about 1 h and the individual sessions about 45 min. The following tasks were administered in the collective session: (1) the lexical decision task, (2) the reading comprehension task, and (3) the spatial subscale of the PMA. The other tasks were administered in individual sessions, along with the written narrative tasks.

Participants obtained a comparable performance in all the reading decoding – $F < 1$ – and writing tasks – $F(1, 34) = 1.89$ $p = .179$ – (see Table 1), as well as in the spatial relations – $F < 1$ – and vocabulary subscales of the PMA – $F(1, 34) = 2.19$ $p = .149$ – and in the CPM – $F(1, 34) = 2.07$ $p = .159$, while they differed clearly in the reading comprehension task $F(1, 34) = 324.83$, $p < .001$, $\eta^2 = .90$.

3. Material

3.1. Expressive writing task

The tasks consisted of cartoon strips adapted from an Italian battery for assessing writing skills (Tressoldi, Cornoldi, & Re, 2013). Two strips were used, each containing five cartoons: one strip told the story of a child falling off a tree; the other described an old lady being robbed by a thief in the street. The two strips were designed to have the same characteristics (in terms of familiarity, and number of characters). Two versions of the task were developed: one involved making causal inferences, while in the other all the information needed to understand and then tell the story was contained in the pictures. Each of the two cartoon strips (the story about the child and the story about the old lady) was therefore prepared in two versions (one with and one without the need for causal inferences, see Fig. 1), and they were presented to participants in two separate sessions in a counterbalanced fashion.

The version of the first story (the child who falls from the tree) with causal inferences requires that the child infer and explain why the branch broke, and how the boy reached the hospital. For the second story, the version with inferences requires that the child explain why the thief can steal the handbag and how the policeman catches the thief.

Each participant was asked to give a written account of the story in a cartoon strip to enable a friend to understand what happened to the main character (the child or old lady). Performance in the two tasks was measured both quantitatively and qualitatively. First, the number of words produced and the number of spelling mistakes (as a percentage of the total number of words) were recorded and considered as quantitative measures.

As for the measures assessing the quality of the texts, two blinded raters were asked to examine the texts considering five qualitative parameters and using established assessment measures (Re, Cazzaniga, Pedron, & Cornoldi, 2009; Tressoldi et al., 2013). The raters had to assess the following parameters on a Likert scale from 1 to 5 (for more information see Appendix 1):

- Adherence: the participant's ability to fulfill the requirements of the task; a higher score was therefore assigned to written texts addressed to a fictional friend and describing what happened or what the writer had seen;
- General impression: the coherence and richness of the ideas expressed;
- Text structure: the organization of the text was judged to be satisfactory when it was organized into a three-part structure with a beginning (introducing the event), a middle (explaining what happened), and an end (reporting the outcome);
- Lexicon: the appropriateness and variety of the words used;
- Syntactic structure: sentence construction (the use of direct or indirect discourse) and coordination/subordination between sentences, i.e. the use of connectives, the correct use of verb tenses, and the proper agreement between the gender and number of nouns, verbs, and adjectives.

Based on a standardized procedure explained in the original manual (Tressoldi et al., 2013), each parameter was assessed on a 5-point scale where: 1 meant 'considerably below grade'; 2 was 'somewhat below grade'; 3 was 'grade-appropriate';

4 was 'somewhat above grade'; and 5 was 'considerably above grade'. The authors, blinded to whether a given participant belonged to the poor or good comprehender group, rated the written narratives. The inter-rater reliability was acceptable; in particular, it was .85 for Adequacy, .93 for Global impression, .93 for Text structure, .80 for Lexicon, and .93 for Syntactic structure, when the Inference condition was considered, while it was .93 for Adequacy, .83 for Global impression, .90 for Text structure, .82 for Lexicon, and .91 for Syntactic structure in the No inference condition. The scores assigned by the first rater (the first author) were therefore used.

Participants were given about 10 min to write the text.

Text cohesion. To gain a better understanding of the differences between our poor and good comprehenders, their performance was also assessed in terms of text cohesion. The proportion of connectives used in the narrative was computed, distinguishing between *additive*, *temporal*, *adversative* and *causal* words (Cain, 2003; Cain, Patson, & Andrews, 2005; Shapiro & Hudson, 1991), and calculating their proportions in all the propositions in the narrative, where a proposition consisted of a subject and a predicate, as suggested by Cain (2003).

4. Results¹

4.1. Expressing writing

4.1.1. Quantitative parameters

The differences between the two groups in terms of the number of words produced were analyzed using a mixed-design, repeated-measures ANOVA, with Group as the between-subjects factor and condition (Inference vs. No inference) as the within-subject factor. There was a main effect of condition, $F(1, 34) = 7.64$, $p = .009$, $\eta^2 = .18$, the texts in the Inference condition being longer than in the No inference condition. No differences emerged between the two groups, $F(1, 34) = 3.26$, $p = 0.08$, $\eta^2 = .08$, and the interaction was not significant $F < 1$ (see Table 2).

As for the number of sentences, there was a main effect of condition $F(1, 34) = 6.17$, $p = .018$, $\eta^2 = .15$, with both groups producing a larger number of sentences in the Inference than in the No inference condition. On the other hand, the effect of Group was not significant, $F(1, 34) = 3.79$, $p = .060$, $\eta^2 = .10$, nor was the interaction Group \times Condition $F < 1$.

No differences emerged between the two groups in terms of the percentage of spelling mistakes, $F(1, 34) = 1.15$, $p = 0.29$, $\eta^2 = .03$, and neither the effect of condition $F(1, 34) = 2.37$, $p = 0.13$, $\eta^2 = .06$, nor the Group \times Condition interaction proved significant ($F < 1$).

4.1.2. Qualitative parameters

The descriptive statistics for the parameters assessing the quality of the texts are shown in Table 2. We first considered the participants' adherence to the requirements of the task: the group differences, $F(1, 34) = 1.76$, $p = .19$, $\eta^2 = .05$, and interaction, $F(1, 34) = 2.38$, $p = .13$, $\eta^2 = .07$ were not significant. The main effect of Condition was marginally significant, $F(1, 34) = 3.94$, $p = .055$, $\eta^2 = .10$, texts in the Inference condition fulfilling the task more than texts in the No inference condition.

General impression – The results showed only a main effect of Group, $F(1, 34) = 9.12$, $p = .005$, $\eta^2 = .21$, the good comprehenders' production being judged more consistent and richer than that of the poor comprehenders. The effect of Condition, and the Group \times Condition interaction, $F < 1$, were not significant.

Text structure – Our results showed a main effect of Group, $F(1, 34) = 12.97$, $p < .001$, $\eta^2 = .28$, i.e. the good comprehenders' narrative followed the typical structure of a story, while this was not true of the poor comprehenders. The effect of Condition, and the Group \times Condition interaction, $F < 1$, were not significant.

Lexicon – Here again, there was only a main effect of Group, $F(1, 34) = 10.78$, $p < .001$, $\eta^2 = .24$, the good comprehenders' use of lexicon being found more appropriate than the poor comprehenders'. Neither the effect of Condition, nor the Group \times Condition interaction, $F < 1$, were significant.

Syntactic structure – The analysis yielded only a main effect of Group, $F(1, 34) = 8.56$, $p = .006$, $\eta^2 = .20$, the good comprehenders' syntax being considered more appropriate than the poor comprehenders'. The effect of Condition, and the Group \times Condition interaction, $F < 1$, were not significant.

4.1.3. Text cohesion

A 2 (group: good vs. poor comprehenders) \times 2 (condition: inference vs. no inference) \times 4 (type of connective: additive vs. temporal/conclusive vs. adversative vs. causal/final) repeated-measures ANOVA was run on the proportions of connectives used in the children's texts. The main effect of Group was not significant $F(1, 34) = 1.46$, $p = .23$, nor was the effect of Condition. The proportion of connectives varied depending on the type of connective considered, $F(3, 102) = 72.62$, $p < .001$, $\eta^2_p = .67$: additive connectives were used more frequently than temporal/conclusive, adversative or causal/final connectives ($p < .001$), followed by adversative connectives ($p < .001$); no differences emerged in the frequency of use between the temporal/conclusive and causal/final connectives. The type of connective interacted with condition too, $F(3, 102) = 3.39$, $p = .021$, $\eta^2_p = .12$, causal/final connectives being used more frequently in the Inference condition ($p = .001$); the within-condition analysis showed that the general pattern emerged in the main effect analysis.

¹ All the analyses were also run using age as a covariate, but the general pattern of the results did not change.

Table 2
Descriptive statistics in the Inference vs. No inference tasks by group.

	Good comprehenders				Poor comprehenders			
	Inference		No inference		Inference		No inference	
	M	SD	M	SD	M	SD	M	SD
Number of words	56.61	20.06	50.33	35.80	46.56	10.29	36.39	10.98
Number of sentences	10.83	3.50	9.72	6.89	9.11	2.03	6.83	1.82
% spelling mistakes	0.04	0.04	0.03	0.04	0.03	0.04	0.02	0.02
Adequacy	3.50	0.62	3.44	0.78	3.44	0.62	3.00	0.69
Global impression	3.50	1.10	3.44	0.98	2.72	0.67	2.67	0.59
Text structure	3.67	1.08	3.56	0.78	2.67	0.69	2.89	0.83
Lexicon	3.17	0.71	3.17	0.79	2.67	0.59	2.61	0.50
Syntactic structure	3.33	1.14	3.22	1.00	2.50	0.71	2.50	0.62

The Group \times Type of connective interaction was significant too, $F(1, 102) = 5.96, p = .001, \eta^2_p = .15$: poor comprehenders used a smaller proportion of causal/final connectives and a larger proportion of additive connectives than good comprehenders ($p = .001, p = .012$, respectively); no intergroup differences emerged for the other two types of connective (see Fig. 2). The within-group comparisons showed the same general pattern of results as described above. No other effects were significant.

5. Discussion

The aim of our study was to further analyze the performance of poor comprehenders in expressive writing tasks. Previous studies had found their performance impaired on several levels, particularly as regards story structure (e.g. Cragg & Nation, 2006), but not when text length and spelling were considered. The literature might give the impression that a possible source of these children's difficulties relates to the characteristics of the story prompt, especially when narrative tasks are compared with descriptive tasks (as suggested by Carretti et al., 2013). For instance, visual prompts usually consist of series of pictures, and different processes are involved in understanding the story: the storyteller needs to identify the relevant information in each cartoon, combine it, and infer causes not explicitly presented in the pictures in order to construct a coherent story. To shed light on how poor comprehenders' performance is affected by these various processes, we compared two conditions in the present study: one mirrored the standard procedure used to elicit narratives, so to understand the story the child had to be able to draw crucial causal inferences; in the other condition, all the information needed to follow the sequence of events were contained in the pictures.

Our results partly replicate previous findings in poor comprehenders, i.e. that their performance is impaired in terms of how they organize the content of their text. In fact, the length of their narratives and their percentage of spelling mistakes are roughly comparable with those of good comprehenders (Carretti et al., 2013, 2014; Cragg & Nation, 2006), while poor comprehenders' stories have a less adequate structure, less varied vocabulary, and weaker syntactic structure than those of good comprehenders.

As mentioned in Section 1, our manipulation of the task was devised to see whether poor comprehenders' weak performance in expressive writing is mediated by the need to draw inferences to construct the narrative. We found that, whatever the condition (regarding the need for inference or not), poor comprehenders produced less effective written texts even though they understood the requirement of the task (since their adequacy scores were comparable). It therefore seemed that their weaker performance in written narrative production concerns the ability to integrate information, or

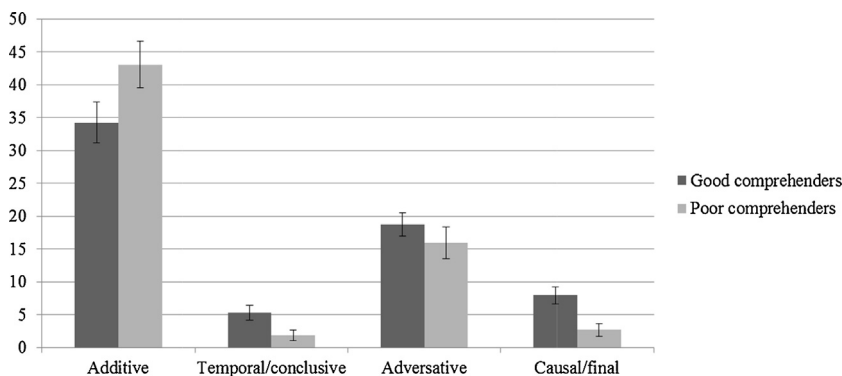


Fig. 2. Types of connective used, by group.

knowledge of the story's structure, rather than the need to draw inferences about the story. This could be in part related to their weak working memory capacity (e.g. Carretti, Borella, Cornoldi, & De Beni, 2009): the construction of a coherent representation relies on working memory resources.

There could be other explanations, however. For example, we cannot be sure that our poor comprehenders fully understood the cartoon strip, especially in the condition that demanded inferences. In other words, their weaker performance could be partly attributable to a poor understanding of the story. In fact, several studies have pointed to an overlap between the processes involved in understanding events represented as a sequence of pictures, or as a written or oral narrative (e.g. Gernsbacher, 1997); unfortunately, such studies did not include a measure of comprehension, so no definite conclusions could be drawn on this issue.

Concerning connectives, i.e. the cohesive devices that identify relationships between clauses and are crucial to the construction of a coherent representation of a text's meaning (e.g. Cain & Nash, 2011), it appears that poor comprehenders' narratives are less cohesive, tending to contain more additive connectives, and this would explain the generally lower quality of their texts. The poor comprehenders' narratives lack the fundamental characteristic of a story, which is to report the causal connections between events; they are more like a list of events with a description of each picture. Our results concerning the use of connectives are consistent with the report from Cain et al. (2005), who found that poor comprehenders had more difficulty understanding and using connectives. In the Cain et al. study (2005), poor and good comprehenders were shown texts in which some conjunctions had been omitted and asked to choose the appropriate word from among three options. The poor comprehenders' performance was generally worse in terms of the number of correct answers, and they also completed the cloze inappropriately, irrespective of the type of conjunction required. This would suggest a link between their poor understanding of conjunctions and their poor usage of them in written (e.g. Carretti et al., 2014) and oral expression (e.g. Cain, 2003).

In conclusion, our study indicates that reading comprehension and narrative expression are related: in particular it emerged that the difficulty of poor comprehenders was not influenced by the need to draw crucial causal inferences, in fact irrespectively from the condition, poor comprehenders produced less effective written text. In addition, as already shown in previous studies, texts produced by poor comprehenders were characterized by a greater use of additive conjunctions, and this probably explains the lower quality of their output.

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Appendix 1

- General impression is a general, overall assessment. The rater has to consider the whole text and assess how well it corresponds to the ideal narrative text, considering the richness, structure and coherence of the ideas expressed.
- Adherence, 5, the text turns explicitly to a public (e.g. "Dear friend" or "Boys, I want to tell you a story about a friend of mine..."); 4 the text does not turn explicitly to a public but the story refers to an event that happened to a friend (e.g., Bob, a dear friend of mine, was walking and...); 3 there is a story but there is confusion on the role among narrator, protagonist and public (e.g. "a boy is walking in the street..."); 2 there is a detailed description of the images (e.g. "there is a boy who is walking in the street and then..."); 1 a simple list of the image's elements (e.g. "in picture 1 I can see a boy who is walking...").
- Text Structure: 5, the texts present a beginning, a development and a conclusion, with an explicit reference to the connections between the different steps of the story; 4, the text presents a beginning, a development and a conclusion omitting at the most two connections; 3 there is a complete structure of the text but there are only two explicit connections; 2 there are not the three parts of the structure of a story (the beginning, the development or the conclusion); 1 a simple description of the images without the development of the story.
- Lexicon: 5 correct, various, precise and appropriate vocabulary (e.g. use of synonymous, exact or technical terms); 4 mainly correct and appropriate vocabulary; 3 mainly correct and appropriate but not precise, the child uses common terms (e.g. "bad" instead of "criminal"); 2 incorrect vocabulary, use of slang expressions; 1 use of an incorrect and inappropriate vocabulary, use of onomatopoeic expressions.
- Syntactic structure assignment of a score ranging from 5 to 1, according the following aspect: presence and adequate use of subordinated sentences, correct sequence of tenses, adequate use of pronouns, concordance between gender and numbers (very important in Italian).

Appendix 2

Example of a story with inference

"Un giorno la mia nonna stava andando a fare la spesa, quando incontra un bel miccio si ferma e lo coccola ma un ladro li vuole rubare la sua borsetta il vigile lo vede e lo arresta così la nonna ha di nuovo la sua borsa."

One day my grandma was going shopping when she met a nice cat. She stopped to cuddle it, but a thief tried to steal her handbag. A policeman saw him and arrested him, so now my grandma has her handbag back.

Example of a story without inference

“Un giorno un mio amico passeggiava per il bosco quando un uccellino cade dal suo nido e lo riporta su ma l'uccellino vuole stare con lui, allora il mio amico si è portato a casa il suo nuovo amichetto.”

One day a friend of mine was walking in a wood when a little bird from its nest. He put it back but the little bird wants to stay with him, then my friend took his new friend home.

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