Original Article

Interference of visual stimuli on the written production of students with no complaints of reading and writing difficulties

Interferências de estímulos visuais na produção escrita de escolares ouvintes sem queixas de alterações na escrita

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ABSTRACT

Purpose: To investigate the influence of visual stimuli on the written production of Elementary School students with no complaints of reading and writing difficulties. **Methods:** Participants were 25 Elementary School children without reading and writing complaints who were enrolled in 3rd and 4th grades of a public school. The following inclusion criteria were adopted: responses at 20 dBHL for frequencies from 500 Hz to 4 kHz on hearing screening; to be enrolled in school for at least two years; and to present alphabetic or orthographic writing level. Participants were divided into small groups, and the written productions were collected in two separate days. Productions were analyzed according to the criteria adopted, which were based on a study regarding communicative skills (generic, encyclopedic and linguistic). Data were statistically analyzed. **Results:** There was no difference in the duration of writing elaboration, regardless the type of visual stimulus. As for the generic skills, the predominant type of discourse was the narrative genre. Regarding the encyclopedic skills, there was evidence of greater intertextuality for the action picture. With regards to the linguistic skills, the produced texts were long, with inadequate score, orthographic errors and partial overall cohesion. **Conclusion:** The visual stimuli presented did not interfere in the written production of Elementary School students regarding communicative skills.

Keywords: Education; Writing; Assessment; Educational status; Narration

INTRODUCTION

The development of writing involves a complex set of skills, such as assimilation, analysis, meta-linguistic abilities, information organization, conciseness and readability[1]. It also requires the activation and coordination of different linguistic abilities, such as semantics, syntax, orthography and writing production in conventional standards. Writing develops after the establishment of reading[2] as these two are interrelated[3].

There are three communication skills[4] that intervene in the discourse knowledge. These skills should be related so that the subject is able to produce a textual interpretation. The general competence is the ability to produce utterances in the context of a number of genres. In turn, linguistic competence is related to mastery of language and encyclopedic competence refers to knowledge about the world.

The composition of narratives requires proper coordination of different cognitive and communication skills as organization of ideas, story development, temporal sequence, interrelationship between events and characters among others[5].

Written narratives are based on oral narratives[6]. The learner needs to be exposed and to have contact with texts in his known environment in order to acquire a true narrative scheme[7]. This occurs because the learner must elaborate ideas, arrange the components and implement the strategies. In this sense, the way a narrative is written indicates the progression of reading and writing skills, becoming an important parameter for Speech-Language Pathology and Educational practices.

The use of pictures to elicit written production is characterized as a standardized stimulus from which children can start their composition. Thus, after seeing a picture, the child needs to understand and identify not only the actions but also

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the intentions of the characters and make inferences regarding the elaboration of a narrative[8].

A study[9] with students from 1st to 4th grades examined the influence of different written production conditions as: free production, oral/written production, production from a sequence of pictures, and reproduction of a story heard. The authors concluded that the picture is important for the development of narrative writing because it provided more elaborate stories - the sequence of four pictures encompassed theme, scene, characters, goal and a problem situation. Therefore, it is possible to infer that the picture is a bridge to literacy process and therapeutic practices.

Based on the foregoing, the present study aimed to verify the influence of visual stimuli on the written production of students of Elementary Education with no complaints of reading and writing difficulties.

METHODS

Ethical considerations

This cross-sectional study was developed after approval by the Ethics Committee for Analysis of Research Projects (CAPPesq) of the School of Medicine of Universidade de São Paulo (USP) under protocol number 1006/08.

Data were collected at a State school at the Western region of São Paulo. The selected school serves families of lower middle class and students attend regular school in the morning and workshop activities in the afternoon.

Participants

Twenty-five children without complaints of reading and writing difficulties, regardless gender and age, participated. Sixteen children were 4th graders and nine were 5th graders of an Elementary Public School.

The following inclusion criteria was adopted for sample selection: hearing screening responses at 20 dB HL to stimuli ranging from 500 Hz to 4 kHz with Pediatric Audiometer (PA5 – Interacoustics®); enrollment in 4th and 5th grades of Elementary Education; enrollment in the referred school for two years or more in order to ensure adaptation to the educational process; alphabetic and/or orthographic level of writing; and no complaints of oral language, reading and writing difficulties. These latter criteria were evaluated by means of the protocol Assessment of Reading and Writing*, Informative Questionnaire completed by teachers**, and anamnesis held with the parents.

Parents and/or guardians who agreed to have their children participating in the study signed an informed consent form (ICF). In addition, teachers of 4th and 5th grades also signed an ICF agreeing to provide data about the performance of participating students.

Materials

Materials for selection of participants

Anamnesis with the parents was conducted to obtain data on personal and family history of participants.

Teachers were asked to complete a questionnaire providing information on academic performance and behavioral characteristics of each child in the sample in order to remove from the sample children who could exhibit any deficits.

The protocol Reading and Writing Assessment of the institution where the study was conducted was used to assess the level of writing. The protocol includes tests of visual recognition of words, reading of words and sentences, word and phrase cloze as well as production of written text.

Otoscopy and hearing screening were carried out with the following instruments: Mini Otoscope Heine® 300 and Pediatric Audiometer (Interacoustics® Pediatric Audiometer – PA5) in order to ensure the level of hearing acuity proposed.

Materials for data collection

Two protocols containing an action figure (Appendix 1) and figures in sequence (Appendix 2) were used for the assessment of written productions.

The figures in sequence were selected based on previous studies[9,10] which had the aim of validating a sensitive tool for small progress in the acquisition of writing of individuals with congenital deafness.

The action figure was obtained from a history book with pictures in sequence[11] that is widely used in the area of language to promote the writing of narrative and discourse in children[5,12,13]. For the current study only one of the sequences containing many actions was selected from the book (Appendix 1).

The Sony® Digital Camcorder SR 47 with internal hard drive was used for video recording during data collection to contextualize the condition of data collection and allow possible further qualitative analysis.

Procedures

Parents and/or guardians of children with no complaints of reading and writing difficulties were invited to a meeting at their school. During the meeting they were informed of the study purposes and were invited to participate. The parents or guardians who agreed to have their children participating signed the ICF. The anamnesis held with the parents allowed the investigation of possible complaints of reading and writing difficulties.

Following, the Information Questionnaire for Teachers and the protocol for Reading and Writing Assessment were applied. The hearing screening with a Pediatric Audiometer (PA) at 50 centimeters away from the ear and without visual cues was carried out at the intensity of 20 dB HL from 500 Hz

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to 4 kHz at to confirm that the participants had no hearing loss.

Children individually performed their written production; they were divided into small groups so they could not communicate to each other during the assessment. The assessment was conducted in a room designated by the school. The application of assessment with the two different stimuli was performed in two alternate days, always during the school period. The total time required to perform the data collection of all participants was three months.

Children were given the following oral instruction: "You will receive a picture and/or a series of pictures and will be asked to produce a written text about the picture". The figures in sequence were used on the first assessment and the action figure on the second assessment.

There was no time limit for the completion of written production, but the duration was recorded for subsequent analysis.

The written productions were qualitatively and quantitatively analyzed according to the adapted[14] communication skills criteria[4] (linguistic, generic and encyclopedic) (Appendix 3).

As for the quantitative analysis, each item, with the exception of discourse type, received a score according to the description and classification presented in Appendix 3. The overall score for each child in each assessment could range from zero to 22 points.

To ensure data reliability, five judges with experience and expertise in the area of reading and writing individually reviewed and scored all written productions after specific training.

Statistical analysis

Statistical tests were performed to compare the written productions based on the action figure and figures in sequence. In some cases, the distribution of results prevented the application of specific statistical tests.

The Wilcoxon test and the McNemar test were applied with a significance level of 5%.

RESULTS

Table 1 displays the comparisons between the overall mean scores provided by the judges for the written productions according to the visual stimuli used (sequence and action).

Table 1. Overall mean score comparison for figures in sequence and action figure

	Action	Sequence	p-value
Mean	13.00	12.97	0.853
Median	12.40	13.40	
SD	2.62	1.77	
n	25	25	

Wilcoxon test (p≤0.05)
Note: SD = standard deviation

As to general competence, 100% of children produced narrative discourse for both stimuli. This result may have interfered in the time duration of written production preparation, which was similar for both stimuli.

Regarding encyclopedic competence, specifically encyclopedic knowledge, there was no difference between the two visual stimuli as 28% of children demonstrated partial knowledge on the topic (score 1) and 40% demonstrated total knowledge on the topic (score 2) (Table 2).

There were no differences between the two types of stimuli on comparisons according to topic reliability; 44.0% of children partially maintained the topic (score 1) and 24.0% maintained the topic (score 2) (Table 2).

The results showed no difference on the use of tittle according to the stimulus presented (Table 2). Only 20% of children exhibited proper use of title related to text production.

There was an indication that the action picture provided higher occurrence of intertextuality use, although it was not possible to apply statistical tests (Table 2).

Regarding the organization of ideas, there was no difference in the distribution of results between the two stimuli. The same was observed for the use of inferences: 52% of subjects presented appropriate inferences (score 2) for both stimuli (Table 2).

Comparing the use of vocabulary, it was observed that 88% of participants used simple vocabulary in the written productions independently of stimulus presented (Table 2).

As for linguistic competence, it was not possible to perform statistical analysis on text length as 60% of children performed texts considered long (five or more paragraphs) for both stimuli (Table 3).

Seventy-six percent of children improperly or insufficiently used punctuation on both stimuli. It was noted that 56% of children made five or more spelling errors, regardless of visual stimulus presented (Table 3).

There were no differences between the written productions for overall cohesion; 40% of children presented adequate cohesion for both stimuli (Table 3).

Furthermore, there was no difference in time children spent on the preparation of written productions on the two visual stimuli (Table 4).

DISCUSSION

The adequate selection of pictures might be a key element in the production of written discourse and guide the work of Speech-Language Pathologists and Educators. Therefore, this study aimed to analyze the influence of different visual stimuli on the written production of children with no complaints of writing difficulties. Importantly, the data were not comparatively analyzed between students of 4th and 5th grades as the sample could not be matched and the investigation of educational level effects was not the main purpose of this study.

The initial hypothesis was that the written productions based on action figures would provide narrative discourse and the productions based on figures in sequence would provide a more descriptive discourse given the very characteristic of each stimulus. This hypothesis was not confirmed as both types of pictures elicited similar discourses.

A possible explanation for the non-interference of visual stimuli type in the written production of children may be related to the content of figures. While it was sought to balance the

Table 2. Comparison of the items of encyclopedic competence on written productions based on figures in sequence and action figures

			Sequence						Total		p-value
			0		1		2				
			n	%	n	%	n	%	n	%	
Encyclopedic knowledge	Action	0	0	0.0	0	0.0	0	0.0	0	0.0	1.000
		1	0	0.0	7	28.0	4	16.0	11	44.0	
		2	0	0.0	4	16.0	10	40.0	14	56.0	
	Total		0	0.0	11	44.0	14	56.0	25	100.0	
Topic fidedignity	Action	0	0	0.0	0	0.0	0	0.0	0	0.0	0.727
		1	0	0.0	11	44.0	5	20.0	16	64.0	
		2	0	0.0	3	12.0	6	24.0	9	36.0	
	Total		0	0.0	14	56.0	11	44.0	25	100.0	
Use of title	Action	0	15	60.0	0	0.0	2	8.0	17	68.0	1.000
		1	0	0.0	0	0.0	0	0.0	0	0.0	
		2	3	12.0	0	0.0	5	20.0	8	32.0	
	Total		18	72.0	0	0.0	7	28.0	25	100.0	
Intertextuality	Action	0	17	68.0	0	0.0	0	0.0	17	68.0	Not applicable
		1	5	20.0	0	0.0	0	0.0	5	20.0	
		2	3	12.0	0	0.0	0	0.0	3	12.0	
	Total		25	100.0	0	0.0	0	0.0	25	100.0	
Organization of ideas	Action	0	0	0.0	0	0.0	0	0.0	0	0.0	0.508
		1	0	0.0	4	16.0	6	24.0	10	40.0	
		2	0	0.0	3	12.0	12	48.0	15	60.0	
	Total		0	0.0	7	28.0	18	72.0	25	100.0	
Use of inference	Action	0	0	0.0	0	0.0	2	8.0	2	8.0	0.454
		1	1	4.0	1	4.0	5	20.0	7	28.0	
		2	1	4.0	2	8.0	13	52.0	16	64.0	
	Total		2	8.0	3	12.0	20	80.0	25	100.0	

McNemar test ($p \leq 0.05$)

Table 3. Comparison of the items of linguistic competence on written production based on figures in sequence and action figures

			Sequence						Total		p-value
			0		1		2				
			n	%	n	%	n	%	n	%	
Text extension	Action	0	0	0.0	0	0.0	0	0.0	0	0.0	Not applicable
		1	0	0.0	7	28.0	3	12.0	10	40.0	
		2	1	4.0	2	8.0	12	48.0	15	60.0	
	Total		1	4.0	9	36.0	15	60.0	25	100.0	
Punctuation	Action	0	0	0.0	0	0.0	0	0.0	0	0.0	Not applicable
		1	1	4.0	19	76.0	3	12.0	23	92.0	
		2	0	0.0	2	8.0	0	0.0	2	8.0	
	Total		1	4.0	21	84.0	3	12.0	25	100.0	
Orthography	Action	0	14	56.0	3	12.0	1	4.0	18	72.0	0.228
		1	0	0.0	4	16.0	2	8.0	6	24.0	
		2	0	0.0	1	4.0	0	0.0	1	4.0	
	Total		14	56.0	8	32.0	3	12.0	25	100.0	
Global cohesion	Action	0	0	0.0	0	0.0	0	0.0	0	0.0	0.754
		1	0	0.0	5	20.0	6	24.0	11	44.0	
		2	0	0.0	4	16.0	10	40.0	14	56.0	
	Total		0	0.0	9	36.0	16	64.0	25	100.0	

McNemar test ($p \leq 0.05$)

Table 4. Comparison of elaboration time of written productions according to figure type (sequence and action)

	Action	Sequence	p-value
Mean	18.64	21.32	0.357
Median	15.00	15.00	
SD	11.11	15.00	
N	25	25	

Wilcoxon test (p≤0.05)
Note: SD = standard deviation

selection of visual stimuli, it was noted only after the analysis that both pictures contained narrative trigger elements, being this a limitation of the study.

As to the general competence, narrative was found as a type of discourse in all written productions for both stimuli. This fact contradicts the literature, in which there seems to be a tendency that figures with simple temporal sequence favor descriptive production[7].

In the current study, the fact that the figures in sequence refer to themes related to vacation/travel – narratives usually explored in school – may have influenced the occurrence of this type of discourse. The results of a study on the written production of Brazilian children showed that, in initial grades, there is a trend for the production of texts without conventional characteristics of stories, such as notes and letters. As the literacy process develops, the written productions are modified and writing of stories appears to sharply progress along the school years[7].

Although the two visual stimuli have propitiated the development of the narrative discourse, it was found that some children produced narratives with argument signs when the stimuli were figures in sequence, suggesting that such stimulation triggers further elaboration of the discourse. Regarding narrator and character marking, it was observed that most children used this marking when the visual stimulus was the action figure.

Regarding encyclopedic competence, specifically to encyclopedic knowledge, the results indicate that children did not present facts related to world knowledge suggested by the images. This would be expected for such educational levels. The practice of reading and writing has unique characteristics and depend on the quality of teaching[15]. It is also essential to consider the history of life, daily and social group activities, and socio-historical context of the school[16].

Regarding the reliability to the topic, vocabulary, and organization of ideas, there was no difference in results when comparing the produced elicited by the two stimuli. This can be justified by the use of narrative discourse, which requires a constant evaluation of the characters, the need to make decisions about the course of the story, and selection of linguistic expressions shared with readers[17].

Although there was no difference regarding intertextuality, the results suggest that the action figure allowed children to better use their previous knowledge, experience with other texts, and creativity[7]. However, vocabulary was simple for written productions elicited by both stimuli and the use of title was also uncommon.

The fact that most children have used inference for both stimuli, albeit partially, can be explained by the presence of figurative elements, i.e., the visual language is the intention and the message the writer wants to convey, allowing the writer to make many inferences and interpretations[8].

The narrative provides important information about the linguistic competence and the pragmatic rules of language in which it is written, since writing stories requires the integration of several skills, besides organization of the linguistic material[18]. Thus, on the linguistic competence, the length of the text, punctuation and spelling was analyzed. In addition, the overall cohesion was included on the analysis given the importance of this aspect on the written production.

The analysis of linguistic competence is closely linked to general competence as the narrative structure involves the organization of ideas in a logical and temporal sequence, which is demarcated by punctuation. Thus, the written text is conventionally presented in the form of paragraphs[19], the latter being boundaries that facilitate the reading process[20,21] and presentation of information[22]. Adding to this, the divisions of paragraphs present the thematic discontinuity, and this may be related to: time, space, dramatic figure, topic or guidance[19].

Another fundamental language proficiency parameter analyzed was punctuation, as it indicates the limits of each paragraph and mark the intonation needed for reading. In the current study, the analysis of written production has shown that the use of punctuation was problematic independently of the visual stimuli presented. This may have occurred because the novice writer writes as if speaking, and, in speech, the contextualization is given by the simultaneous interaction between the sender and receiver of the message. Thus, the role of writing is not well established and can generate the risk of ambiguity by the absence or inadequacy of punctuation[23].

With regard to the orthographic analysis, the production of long texts can justify the high number of spelling errors, that is, the more you write, the more the text is subject to error. Nevertheless, it was noted that for both stimuli, longer texts did not mean better planned as children have shown results below expectations for their educational levels.

Orthographic writing corresponds to a difficult task since it requires a continuous and progressive learning that involves metacognitive and metagraphic (analysis of the spelling) processes to master the spelling rules. These skills should give the learner the ability to explain the reason of the written form of a word. The learner should not only master the alphabetic principle (phoneme-grapheme association) but also the standard spelling with its regularities and irregularities (metagraphic analysis and syntactic knowledge)[24].

As expected for elementary school students, most errors were found to be related to competing letters, which require morphological and linguistic knowledge that are not related to early literacy. The errors of multiple representations are observed in early grades and can persist until adulthood[25].

By analyzing the relationship between morphosyntactic knowledge and spelling performance of children from 2nd to 4th-graders from public and private schools in Recife, an evolution in the writing performance of words, pseudowords, and morphosyntactic knowledge was observed[26]. However,

in that study, students from public school exhibited poorer performance when compared to students from private schools.

A study with the purpose of analyzing the dictation performance of students in 4th grade of elementary school from public and private systems found difference between the two educational systems, suggesting that students from private schools seem to master the spelling system before those from public schools[27]. In that study, the errors with higher occurrence were: multiple representations, rule generalization, omission of letters and absence of punctuation. Such errors were also observed in the current study.

The last aspect of linguistic competence to be discussed refers to the overall cohesion. Results showed that all subjects learned to use cohesion in a partial or total form for both stimuli. This is important to highlight since the average performance of children on other linguistic competence skills was median. Cohesion is a property that defines a good text, as opposed to the sequence of sentences[28]. Perhaps this is an indicator that the children in the current study are initiating a written discourse organization process.

As noted, the performance of children was unsatisfactory in all competences and the ability of composing well-developed narratives must occur without external support[7]. Therefore, the interference of quality of teaching on this process is suggested[29].

No differences were found concerning the time needed for preparation of written productions elicited by both visual stimuli. This may be explained by the predominance of narrative discourse on productions elicited by both stimuli.

Studies are the current one are essential for the establishment of normality ranges for parameters related to written productions of elementary school children. Furthermore, the use of visual stimuli to elicit written production might aid on such standardization. A pilot study for the selection of figures in sequence with well-defined and explicit actions regarding the temporal sequence is suggested. The action figure should contain a series of stimuli which, when combined, present a range of triggers of the aimed discourse type.

CONCLUSION

The visual stimuli presented did not interfere in the written production of children in relation to communication competence. The use of figures, both in sequence and action, stimulated production of narrative discourse. In relation to linguistic and encyclopedic competence, the results did not show an effect for figure type (sequence or action). However, it should be highlighted that children in the current study exhibited an underperformance when considering their educational level.

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RESUMO

Objetivo: Verificar a influência de estímulos visuais na produção escrita de escolares do ensino fundamental sem queixas de alterações de leitura e escrita. **Métodos:** Participaram 25 crianças sem queixa de leitura e escrita, que cursavam a 3ª e 4ª série (4º e 5º ano atuais) do ensino fundamental de uma escola pública. Adotaram-se como critérios de inclusão: respostas a 20 dBNA nas frequências de 500 Hz a 4 kHz na triagem auditiva; frequentar a referida escola por dois anos e possuir nível alfabético ou ortográfico de escrita. Os participantes foram separados em grupos pequenos e em dois dias realizaram as produções escritas que foram analisadas segundo critérios adaptados com base em um estudo sobre as competências comunicativas (genérica, enciclopédica e linguística). Os dados receberam análise estatística. **Resultados:** Não houve diferença quanto ao tempo de elaboração da escrita, independente do estimulo visual. Quanto à competência genérica o tipo de discurso predominante foi o narrativo. Em relação à competência enciclopédica houve indícios de maior intertextualidade para a figura de ação. No que concerne à competência linguística, os textos foram longos, com pontuação inadequada, erros ortográficos e coesão global parcial. **Conclusão:** Os estímulos visuais apresentados não interferiram na produção escrita dos escolares do ensino fundamental em relação às competências comunicativas.

Descritores: Educação; Redação; Avaliação; Escolaridade; Narração

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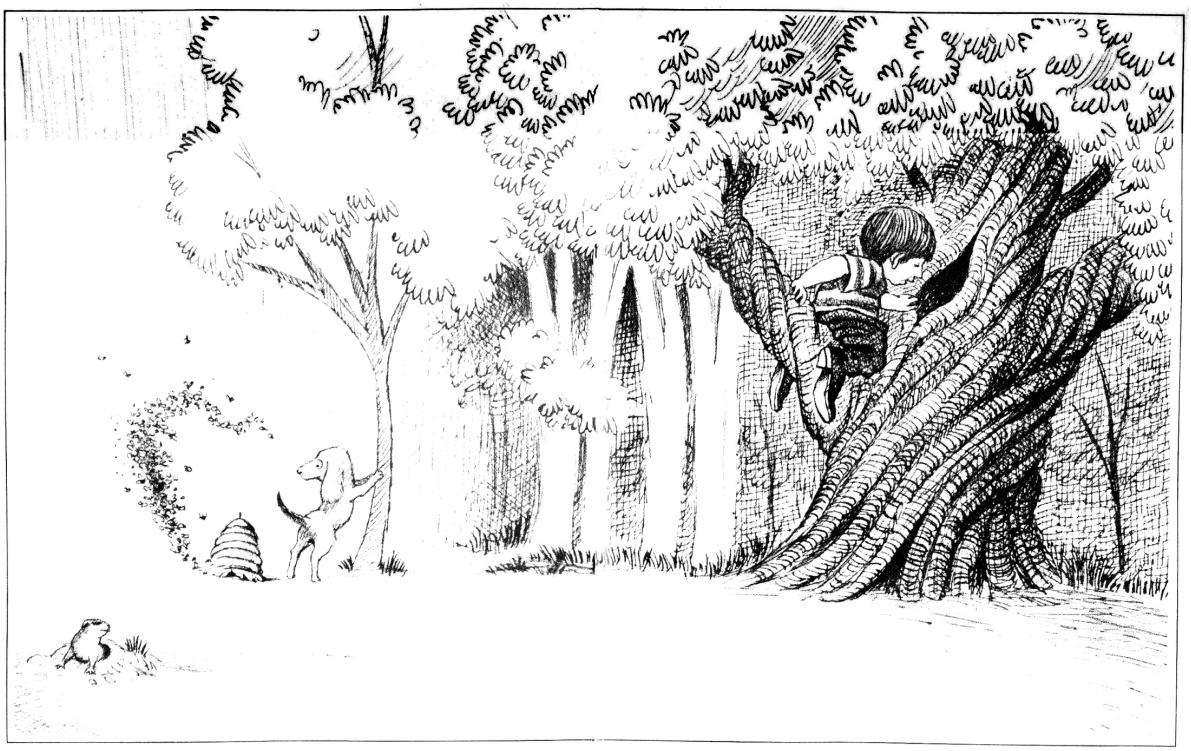
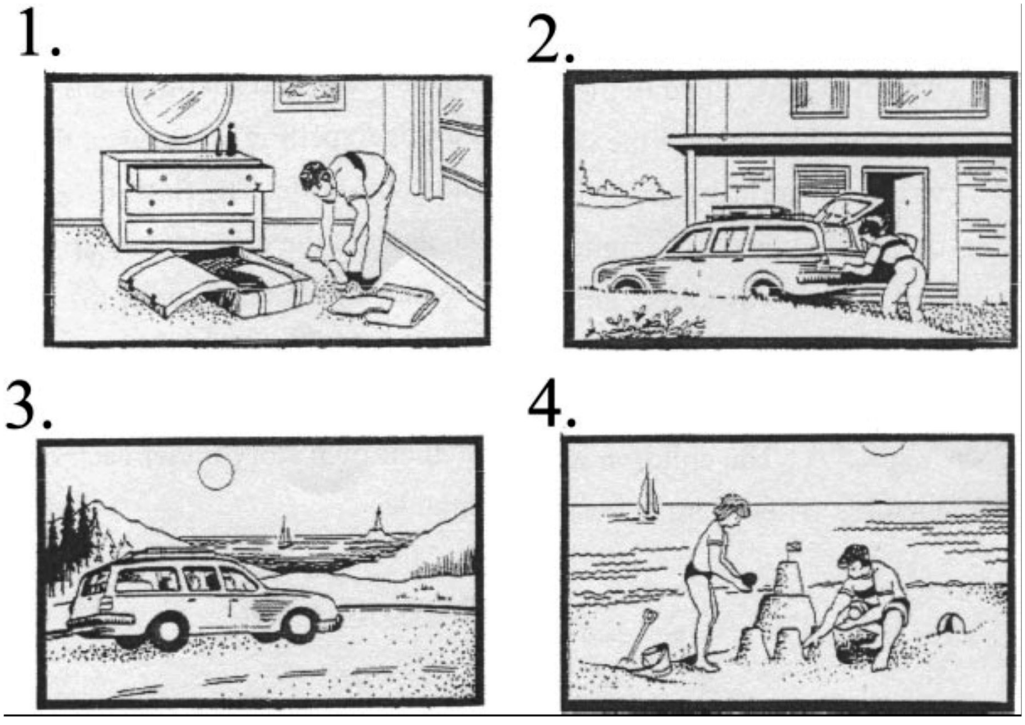
Appendix 1. Protocol for assessment of written production based on action figure

Name: _____
Date of Birth: _____
Researcher: _____
Date: _____



Appendix 2. Protocol for the assessment of written production based on four figures in sequence

Name: _____
Date of Birth: _____
Researcher: _____
Date: _____



Appendix 3. Clssification and score criteria of written productions according to Lima and Cárnio (2007)[14]

Competence	Description	Classification	Score
Generic	Discourse type	• Narrative: • Report: • Argumentation: • Exposure: • Description:	
Encyclopedic	Encyclopedic knowledge	• Knowledge of the topic • Partial knowledge of the topic • No knowledge of the topic	• 2 points • 1 point • 0 point
	Topic fidedignity	• Topic maintenance • Partial topic maintenance • No topic maintenance	• 2 points • 1 point • 0 point
	Title use	• Use of title related to text production • Use of title not related to text production • No title	• 2 points • 1 point • 0 point
	Intertextuality	• Present • Partially present • Absent	• 2 points • 1 point • 0 point
	Organization of ideas	• Adequate • Partially adequate • Inadequate	• 2 points • 1 point • 0 point
	Use of inferences	• Adequate • Partially adequate • Inadequate	• 2 points • 1 point • 0 point
	Vocabulary	• Complex • Simple • Inadequate	• 2 points • 1 point • 0 point
Linguistic	Text extension	• Long: 5 or more paragraphs • Medium: 2 to 4 paragraphs • Short: 1 paragraph	• 2 points • 1 point • 0 point
	Punctuation	• Sufficient and adequate in most paragraphs • Insufficient or inadequate • Absent	• 2 points • 1 point • 0 point
	Orthography	• Up to 2 orthographic errors • From 2 to 5 orthographic errors • More than 5 orthographic errors	• 2 points • 1 point • 0 point
	Global cohesion	• Present • Partially present • Absent	• 2 points • 1 point • 0 point