Original Article

Influence of visual stimuli in the written production of deaf signers with complaints of writing impairment

Influência de estímulos visuais na produção escrita de surdos sinalizadores com queixas de alterações na escrita

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ABSTRACT

Purpose: To investigate the influence of two types of visual stimuli in the written production of deaf signers with complaints of reading and writing alterations. **Methods:** Participants were 13 deaf students who were users of sign language and had complaints of reading and writing alterations (seven male and six female). Subjects' mean age was 13 years, and they presented severe or profound sensorineural hearing loss (average threshold lower than 71 dBHL in the frequencies of 500 Hz, 1 and 2 kHz). The educational level of participants ranged from 3rd to 8th grades of public and private elementary schools. They were evaluated for their performance in Brazilian Sign Language (LIBRAS), and carried out written productions based on two visual stimuli: an action picture and a sequence of pictures. The written samples were analyzed according to criteria adapted from the Communicative Competence Theory (Generic, Encyclopedic and Linguistic). Data were statistically analyzed. **Results:** Regarding the Generic Competence, the predominant type of discourse was Narrative. Both Linguistic and Encyclopedic competences were impaired, regardless the stimuli used. **Conclusion:** Both types of visual stimuli used in the study did not provide differentiated written productions in deaf signers with complaints of writing alteration.

Keywords: Education; Evaluation; Deafness; Writing; Sign language

INTRODUCTION

Deaf users of sign language who are inserted within the deaf community since birth acquire language and, consequently, world knowledge through this system of signs. The Brazilian Sign Language (LIBRAS) has its own characteristics and, like other sign language systems, particular grammar and structures; thus, it does not correspond to a signed Brazilian Portuguese[1].

The lack of correspondence between signs and written words is one of the causes of difficulties in written language acquisition by deaf subjects, since the numbers of written words and signs used to express the same sentence are not necessarily similar, which is due to the fact that sign language does not represent articles, connectives, and verbal inflection – elements present in the written modality[2-4].

Studies have shown similarities between the initial writing of deaf and hearing subjects, for, in a first level, there is a relationship between writing and drawing, while in a second level, there is a less figurative representation. The third level is characterized by the manifestation of differences between the writing of deaf and hearing youngsters, marking the beginning of the reflection regarding speech and writing for hearing subjects, and between signs and writing for deaf subjects[5].

In the acquisition process of reading and writing, the deaf uses visual processing, and not the grapho-phonemic correspondences[6], as they are known to this moment. However, it is not yet clear if the written productions of deaf subjects have peculiar characteristics due to the auditory deprivation, or if some of them present, other than this deprivation, reading and writing disorders.

The pedagogy of inclusion advocates for the different learning styles and the individual's singularity, respecting each subject's rhythm, interests, desires and conceptions of

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the world[7]. Hence, regardless of the presence of a reading and writing disorder, the deaf individual needs specific intervention strategies and, preferably, individualized educational programs[8].

One of the efficient strategies that have been pointed out in literature for lexicon expansion and metalinguistic development in deaf signers is the use of visual resources, due to the fact that images usually provide a self-explained context.

In a case study conducted with a deaf young woman who used LIBRAS[7], the authors observed that the use of images associated to discursive practices in LIBRAS and in written Brazilian Portuguese as a pedagogic resource provided expansion and improvement of both signaled and written discourses, establishing relationships and inferences between the proposed topics. In this case, the use of visual stimuli proved to be a substantial resource in the learning of the subject, besides providing a significant cognitive development[7]. However, the effect of the type of visual stimulus presented (sequenced or isolated images) to elicit discourse in children is not yet clear, and needs more elucidation[9].

In Brazil, there is a lack of materials directed towards teaching the written Brazilian Portuguese for deaf individuals users of LIBRAS. Thus, it is necessary to investigate the type of visual stimuli that would provide greater contribution for learning and improvement of writing in this specific population[10].

Considering the exposed and the visual-spatial character of LIBRAS, the present study had the aim to verify the influence of two types of visual stimuli in the written production of deaf signers with complaints of writing impairment.

METHODS

Participants

The present cross-sectional study was approved by the Research Ethics Committee of the School of Medicine of the Universidade de São Paulo, under number 1043/08. The legal guardians of the subjects signed the Free and Informed Consent Term.

Participants were 13 deaf signer students with complaints of writing impairment, seven male and six female. Subjects' mean age was 13 years, and they had severe or profound sensorineural hearing loss (average threshold lower than 71 dBHL in the frequencies of 500 Hz, 1 and 2 kHz). It is important to emphasize that the term "complaints" refer to the difficulties presented by the deaf subject, which prevented him/her from following the academic performance of their peers in the classroom, even with all access to the curricular content and the linguistic aid.

At the time of data collection, six subjects were enrolled between 3rd and 8th grades of three public elementary schools for deaf individuals; one was enrolled in the 4th grade at a special class within a regular public school; and six between 3rd and 4th grades of a private/philanthropic school for deaf individuals. All subjects were in the alphabetic level of writing, but presented complaints of reading and writing alterations. Eleven subjects had a history of speech-language therapy focusing on reading and writing, and only two had never been enrolled in this type of therapy, even though they studied in a special school for deaf children.

Place

Data from the six students enrolled in the private/philanthropic school for deaf individuals were collected at the school. The other subjects had their data collected at the Investigation Laboratory in Reading and Writing of the Speech-Language Pathology and Audiology Undergraduate Program of the School of Medicine of the Universidade de São Paulo, where they received or were enrolled to receive speech-language pathology intervention. Both places provide the infrastructure needed to conduct the research.

Procedure

Selection of subjects

The parents of the deaf students attended a previously scheduled interview at the Laboratory, where they signed the Free and Informed Consent Term and answered an anamnesis. The parents of the children enrolled in the private/philanthropic special school for deaf children underwent the same procedure at the school.

Subjects were assessed using the Reading and Writing Evaluation Protocol* with the aim to get to know and to guarantee that all participants were in the alphabetic writing level. The deaf instructor who participated in the study applied an assessment of the Brazilian Deaf Sign Language** in order to guarantee that all participants were proficient in LIBRAS.

For the subjects with complaints of writing impairments who were already enrolled in therapy or who were on the waiting list for therapy at the Laboratory, the assessment was carried out individually, in alternate days, in previously scheduled appointments. For the private/philanthropic special school students, data collection was also carried out individually and in alternate days. The only difference in the procedure was that the subjects were conducted in small groups to a room designated by the direction of the school, where the desks were placed as to avoid any kind of communication between them. In both cases, the assessment was carried out in the presence of a deaf instructor, a Technical Training fellow, and a Scientific Initiation student, and the total period of data collection was of four months.

Data collection

After the selection of the subjects, the data collection procedure using two types of visual stimuli[11] to elicit written text

* Alves D, Cárnio MS. Protocolos para avaliação de leitura e escrita. São Paulo: Departamento de Fisioterapia, Fonoaudiologia e Terapia Ocupacional da Faculdade de Medicina da Universidade de São Paulo; 1999. [Unpublished protocol]

** Crato AN, Cárnio MS. Protocolo para avaliação da língua brasileira de sinais de surdos. Elaborated for the Investigation Laboratory in Reading and Writing of the Speech-Language pathology Undergraduate Program of the School of Medicine of the Universidade de Sáo Paulo, 2007. [Unpublished protocol]

elaboration was initiated. Task I consisted of an action picture, and task II, of a sequence of pictures.

The action picture was taken from a storybook with a sequence of pictures[12]. This book is widely used in language research to elicit written narratives in children[13-15].

The sequence of pictures was selected from a study[3] that used sequential figures to evaluate British deaf children. The method, including the pictures, was validated in another study[16].

Participants received orientation regarding the procedures for each task elicited by visual stimuli through a video recorded by a deaf instructor, which contained instructions about tasks I and II. This procedure allowed that the instructions for the tasks were standardized for all participants. They found, in each desk, a pencil and a sheet of bond paper with a heading to be fulfilled with personal data, and four pictures displayed in sequence (task II). In another occasion, the same procedure was carried out for the action picture (task I).

There was no limit of time to carry out the written productions. However, the whole process of writing production was filmed and timed in order to contextualize the data collection situation and, hence, provide data for qualitative analysis, complementary to quantitative analysis.

Written productions were analyzed according to the Communicative Competence criteria (Linguistic, Generic, and Encyclopedic)[17], adapted from another study[18], in which a protocol for the register of the data observed was elaborated. Each written production was quantitative and qualitatively analyzed, and the maximum score that could be obtained in each production was 22 points.

All written productions were analyzed by five judges, with the aim to obtain data reliability, since the writing of deaf individuals presents particular characteristics due to difficulties with vocabulary and syntax. The group of five judges comprised a Scientific Initiation student, two Technical Training fellows, the supervisor of the study, and the deaf instructor, all with experience in reading and writing evaluation. Initially, all judges met for training and discussion of the analysis criteria for the written productions. After data from the analyses were tabulated, it was verified agreement of 80% among judges; discordant cases were discussed by the team in order to reach a consensus.

Statistical analysis

Comparative statistical analyses were conducted between the written productions elicited by an action picture and by a sequence of pictures. In most cases, data distribution was not significant between both stimuli; thus, according to the probabilities, the following tests were applied: McNemar test and Wilcoxon test.

RESULTS

Results regarding the Communicative Competencies: Generic, Encyclopedic, and Linguistic, are presented separately, according to the competence analyzed.

With regards to the Generic Competence (Table 1), no difference was observed between written productions, that is, the predominant type of discourse was Narrative for both types of stimuli.

In the Encyclopedic Competence (Table 2), subjects' performance in the item regarding Encyclopedic Knowledge was similar for both stimuli. However, it is noted that only one subject presented Encyclopedic Knowledge when the action picture was used to elicit the written production, and three subjects with the sequence of pictures.

As for Reliability to the Theme, the results were not significant for either of the visual stimuli, and most subjects had a partial score.

It was verified that the Title was used only with the action figure, and only by one subject. Moreover, no difference was found regarding the use of Intertextuality for both stimuli, since all subjects scored zero in this item.

Regarding the Organization of Ideas, the tasks elicited with both types of visual stimuli presented inadequate and/or partially adequate results, with no difference between them.

It was not possible to apply statistical tests to analyze the results regarding the use of Inferences because most subjects did not score on this item, or used it in an inappropriate manner, regardless the stimulus.

In the item Vocabulary, all participants used simple vocabulary in their written productions, which also invalidated the use of statistical tests.

Regarding Linguistic Competence (Table 3), it was observed the predominance of short written productions, evidenced by the absence of statistical significance.

In the item Punctuation, it was not possible to apply statistical tests, because most subjects did not use punctuation or used it inadequately with both stimuli. One subject used enough adequate punctuation in most paragraphs, however, only when the stimulus presented was the action picture.

No difference was found between written productions for both stimuli regarding Orthography. It was observed that

Table 1. Comparison of subjects' performances in the written production elicited by sequence of pictures and action picture regarding the Generic Competence

		Sequence				Total		p-value
		Description		Narrative				
		n	%	n	%	n	%	
Action	Description	3	23.1	2	15.4	5	38.5	1.000
	Narrative	1	7.7	7	53.8	8	61.5	
Total		4	30,8	9	69.2	13	100.0	

McNemar test ($p<0.05$)

Table 2. Comparison of subjects' performance in the written production elicited by sequence of pictures and action piction regarding the Encyclopedic Competence

Ação			Sequence						Total		p-value
			0		1		2				
			n	%	n	%	n	%	n	%	
Encyclopedic knowledge	Action	0	4	30.8	0	0.0	0	0.0	4	30.8	0.223
		1	1	7.7	5	38.5	2	15.4	8	61.5	
		2	0	0.0	0	0.0	1	7.7	1	7.7	
	Total		5	38.5	5	38.5	3	23.1	13	100.0	
Reliability to the theme	Action	0	2	15.4	3	23.1	0	0.0	5	38.5	0.082
		1	0	0.0	5	38.5	2	15.4	7	53.8	
		2	0	0.0	0	0.0	1	7.7	1	7.7	
	Total		2	15.4	8	61.5	3	23.1	13	100.0	
Use of title	Action	0	12	92.3	0	0.0	0	0.0	12	92.3	Not applicable
		1	0	0.0	0	0.0	0	0.0	0	0.0	
		2	1	7.7	0	0.0	0	0.0	1	7.7	
	Total		13	100.0	0	0.0	0	0.0	13	100.0	
Intertextuality	Action	0	13	100.0	0	0.0	0	0.0	13	100.0	Not applicable
		1	0	0.0	0	0.0	0	0.0	0	0.0	
		2	0	0.0	0	0.0	0	0.0	0	0.0	
	Total		13	100.0	0	0.0	0	0.0	13	100.0	
Organization of ideas	Action	0	4	30.8	2	15.4	1	7.7	7	53.8	0.223
		1	0	0.0	5	38.5	0	0.0	5	38.5	
		2	0	0.0	0	0.0	1	7.7	1	7.7	
	Total		4	30.8	7	53.8	2	15.4	13	100.0	
Use of inferences	Action	0	8	61.5	1	7.7	0	0.0	9	69.2	Not applicable
		1	2	15.4	1	7.7	1	7.7	4	30.8	
		2	0	0.0	0	0.0	0	0.0	0	0.0	
	Total		10	76.9	2	15.4	1	7.7	13	100.0	
Vocabulary	Action	0	0	0.0	0	0.0	0	0.0	0	0.0	Not applicable
		1	0	0.0	13	100.0	0	0.0	13	100.0	
		2	0	0.0	0	0.0	0	0.0	0	0.0	
	Total		0	0.0	13	100.0	0	0.0	13	100.0	

McNemar test ($p<0.05$)

a higher proportion of subjects presented less orthographic errors in the task elicited by the action picture. Nevertheless, in general, subjects presented few errors.

As for Global Cohesion, no difference was found for both stimuli.

The comparison between the average total score obtained in the tasks (Table 4) showed no difference between the written productions according to the visual stimuli presented.

DISCUSSION

There is a consensus that deaf signers usually present simple written productions, usually composed of juxtaposed words, which, if analyzed within a context that include the use of sign language, have global coherence.

However, it is important that this population knows and adequately uses the linguistic structure of the written Portuguese, allowing better academic evolution, social integration, and easier access to the labor market. In this sense, strategies and methodologies for written language teaching are essential to the encouragement and adequacy of written productions in this population[3,10,14].

The results regarding the Generic Competence evidenced predominance of the narrative genre, regardless the visual stimulus presented. All subjects who used the narrative genre for the action picture had been previously enrolled in speech-language pathology therapy. The same was observed for the sequence of pictures, except for a subject who produced a narrative discourse and had no history of previous therapy.

The results suggest that the presence of narrative discourses might have been a consequence of speech-language pathology intervention, since the narrative is an element widely used to organize the written discourse and the deaf takes responsibility

Table 3. Comparison of subjects' performance in the written production elicited by sequence of pictures and by action picture regarding the Linguistic Competence

Action			Sequence						Total		p-value
			0		1		2				
			n	%	n	%	n	%	n	%	
Length of the text	Action	0	5	38.5	2	15.4	0	0.0	7	53.8	0.513
		1	1	7.7	1	7.7	3	23.1	5	38.5	
		2	0	0.0	1	7.7	0	0.0	1	7.7	
	Total		6	46.2	4	30.8	3	23.1	13	100.0	
Punctuation	Action	0	5	38.5	0	0.0	0	0.0	5	38.5	Not applicable
		1	2	15.4	5	38.5	0	0.0	7	53.8	
		2	0	0.0	1	7.7	0	0.0	1	7.7	
	Total		7	53.8	6	46.2	0	0.0	13	100.0	
Orthography	Action	0	0	0.0	2	15.4	0	0.0	2	15.4	0.097
		1	4	30.8	1	7.7	0	0.0	5	38.5	
		2	0	0.0	4	30.8	2	15.4	6	46.2	
	Total		4	30.8	7	53.8	2	15.4	13	100.0	
Global cohesion	Action	0	3	23.1	1	7.7	0	0.0	4	30.8	1.000
		1	1	7.7	7	53.8	0	0.0	8	61.5	
		2	0	0.0	0	0.0	1	7.7	1	7.7	
	Total		4	30.8	8	61.5	1	7.7	13	100.0	

McNemar test ($p<0.05$)

Table 4. Comparison between the mean scores obtained by subjects in the written productions elicited by sequence of pictures and by action picture

	Action picture	Sequence of pictures	p-value
Mean	6.48	6.94	0.223
Median	7.20	6.00	
SD	3.25	3.17	
n	13	13	

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

for the coherence of what is told through it, a condition also known as "author effect"[19].

The analysis of the Encyclopedic Competence was hindered by the fact that the statistical tests were applicable only to the items: Encyclopedic Knowledge, Reliability to the Theme, and Organization of Ideas, in which no differences were observed between the written productions elicited by both types of visual stimuli.

In the item Encyclopedic Knowledge only three subjects showed total knowledge regarding the theme when the sequence of pictures was presented, and only one subject demonstrated such knowledge when the action picture was used. These data may be due to the limited vocabulary and world knowledge that many deaf individuals present[18-23], since both types of visual stimuli presented simple themes which are widely approached in literature stories.

In the item Intertextuality, no difference was noted in both tasks, given that no subject scored in this item. The same was observed for the use of Inferences: most subjects did not use this ability or used it inadequately for both stimuli. This occurrence evidences limited world knowledge[23] and immaturity of the participants regarding the subject of reading and writing[24,25], since these items require previous knowledge of other texts and ability to infer in a situation non-explicit in the text through their own world knowledge[25].

Regarding the Reliability to the Theme, it was observed predominance of its partial maintenance for both stimuli. Hence, it is evidenced the difficulty of deaf signers concerning the identification and maintenance of the proposed theme during writing. This datum shows once again the difficulty of the deaf subject with regards to world knowledge and social literacy[23]. It is also emphasized the lack of linguistic ability when the proposed theme involves situations never experienced before[27].

The Title was used only by one subject, in the written production elicited by the action picture. This fact evidences the immaturity of the deaf subject as a writer, which prevents him from minding the use of this type of resource, a necessary item for the elaboration of a textual production[14].

As for the Organization of Ideas, the tasks elicited by both types of visual stimuli yielded inadequate and/or partially adequate results, with no difference between them. In this sense, literature shows that the written productions of Italian deaf subjects are also redundant and fragmented[28], which was observed in the present study and hindered the organization of ideas. However, it is noted that the sequence of pictures provided better results when compared to the action picture.

All participants used simple vocabulary in their written productions, which corroborates previous studies that found that deaf individuals have difficulties with the use of vocabula-

ry[22]. Hence, it was noted that seven subjects used the support of pictographic elements, evidencing an attempt to represent LIBRAS signs.

In Brazil, deaf children have great difficulty acquiring written vocabulary, since many schools use the same teaching methodology used with hearing children for Portuguese writing[10,28]. Thus, language acquisition is hindered not only by hearing deprivation, but also by limited educational experiences, which use few words in a repetitive manner[21].

With regards to the Linguistic Competence, the statistical analysis was not applicable for the item Punctuation, and in the other items the results also evidenced no difference in the written production of the deaf subjects for both stimuli presented.

As for the Length of the Text, there was also no difference, for the tasks elicited by both types of visual stimuli provided mostly short written productions, once again demonstrating subjects' difficulties with world knowledge and vocabulary[21,23].

Concerning Punctuation, only one subject adequately used this resource, and only for the action picture. Thus, as most subjects did not used punctuation adequately, this item was disregarded by the judges, who used the significant units as initial and final markers for the sentences[3].

Regarding Global Cohesion, no difference was found between stimuli, and subjects presented difficulty in this aspect due to the absence of articles, conjunctions, verbal inflection, and use of plural and passive voice[2-4,21], which do not exist in sign language and are present in the written modality of Portuguese. The difficulty of deaf subjects with syntax[22] also interfered in the global cohesion of the written productions.

It is important to emphasize that a possible limitation of the present study might have been the selection of the visual stimuli to elicit the written productions. The selection was conducted judiciously through the search of national and international studies. However, only during the analysis of the written productions it was noted that both stimuli presented actions, and the only difference between them was the fact that one stimulus comprised an isolate picture, and the other one was a sequence of action pictures. Hence, this might have been related to the predominance of narrative discourse and the similarities found between written productions regardless the visual stimulus presented.

However, data obtained in this study provided relevant information regarding the importance to seek themes closer to the reality faced by deaf signers with complaints of writing impairments. Thus, speech-language pathologists who work with this specific population can find in this study assessment parameters for Communicative Competences.

CONCLUSION

It is concluded that the written productions of deaf signers with complaints of writing impairments were not significantly influenced by the type of visual stimulus presented, in all three competences assessed. However, qualitatively, it was possible to observe that some aspects of Linguistic and Encyclopedic Competences might have been influenced by the type of stimulus. This fact provides important contribution to teachers and speech-language pathologists who deal with this population, in the sense that many types of visual stimuli can be used with deaf signers with complaints of writing impairments to elicit written productions.

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RESUMO

Objetivo: Verificar a influência de dois tipos de estímulos visuais na produção escrita de surdos sinalizadores com queixas de alterações na escrita. **Métodos:** Participaram 13 estudantes surdos sinalizadores com queixas de alterações na escrita, sendo sete do gênero masculino e seis do feminino. A média de idade foi de 13 anos, e os sujeitos apresentavam perda auditiva neurossensorial de grau severo ou profundo (pior que 71 dBNA na média das frequências de 500 Hz, 1 e 2 kHz). A escolaridade dos participantes variou de 3ª à 8ª séries do Ensino Fundamental de escolas pública e particular. Os surdos foram avaliados quanto ao desempenho em LIBRAS e realizaram produções escritas com base em estímulos visuais de uma figura de ação e de figuras em sequência, as quais foram analisadas segundo critérios adaptados de acordo com a Teoria das Competências Comunicativas (Genérica, Enciclopédica e Línguística). Os dados foram analisados estatisticamente. **Resultados:** Em relação à Competência Genérica, a tipologia do discurso predominante foi a Narração. Quanto às competências Enciclopédica e Linguística, ambas se mostraram prejudicadas independente dos estímulos apresentados. **Conclusão:** Os dois tipos de estímulos visuais estudados não propiciaram produções escritas diferenciadas nos surdos sinalizadores com queixas de alterações na escrita.

Descritores: Educação; Avaliação; Surdez; Redação; Linguagem de sinais

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