

Text presentation and information processing in Russian

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Abstract

This study is based on the Cognitive Theory of Multimedia Learning (Mayer 2009). We investigated how readers process and comprehend information when reading and listening texts of different formats: infographics, audiotext, infographics combined with audiotext, written format. Biographies of four Russian writers were used as the material. All the stimuli were of the same size and the same level of readability. In a four-group design experiment, 32 foreign students and 32 native speakers of Russian examined four texts in four different formats, answered the factual and analytical after-the-text questions, gave the keywords and estimated the difficulty of each text. The overall results made it possible to build a hierarchy of best-perceived formats for both groups of participants.

Keywords: text processing, multimodal text, text format, and comprehension

Introduction

Multimodal representation of information is getting more and more popular nowadays in various spheres of life. Polycode texts have become an integral part of modern communication. Studies of infographics (i.e. drawings, graphs, diagrams, etc. accompanied by short captions), sketch noting (visual notes consisting of hand-written text and visual elements), advertising texts, multimedia courses integrating verbal and non-verbal means, oral and written presentation of material, and allowing to present complex information in the optimal way, gain ground. Polycode text is a text composed of attributes belonging to different semiotic systems, namely of two non-homogeneous parts: verbal (lingual/spoken) and non-verbal (belonging to other than natural language semiotic systems) (Paivio, 2006). Mayer's (2009) Cognitive Theory of Multimedia Learning suggests that effective engagement with the material presented in the form of polymodal text occurs due to the need to switch attention between text and image, oral signal and text, and establish the connection between these elements. This leads to integration of the new information into the existing cognitive system, as well as the ability to use the acquired information in the future.

Numerous experimental studies of reading mechanisms have been carried out in recent years. However, the text level as an integral unit remains understudied, at least on Russian language material. In particular, of essential

interest is how the text format is related to the text comprehension quality. What type of signal presentation (verbal text or written text) would be most effective in the e-learning format for certain readers/listeners; whether the text presentation of information in a non-verbal form promotes or, conversely, interferes with perception and understanding, and vice versa, how concomitant verbalization affects the understanding and memorization of figurative information and its emotional assessment, remains unclear.

Hypothesis

Reading, processing, and comprehension in texts of different formats are different: multimodal text is easier to process and comprehend than written or oral text of the same content.

Experimental design

Material

Four infographics containing interesting facts from the biographies of four Russian writers were used as the material. Infographics were extracted from Russian newspapers (<http://aif.ru>) and then converted them into regular text format. All the texts and infographics were of the same length and the same level of readability (checked via <http://readability.io/>). The infographics contained the same proportion of verbal and non-verbal elements (<https://cloud.mail.ru/public/HVsi/ujuEL4zFZ>). Afterwards, all the texts were read by the same dicator (female, 23 years old, Russian) and audio-recorded. Thus, we got the 16 stimuli to check how participants integrate text-figure information when processing and understanding the same text in four different formats: infographics (graphic visual representation of information), audiotext, infographics combined with audiotext, plain written format.

Table 1. Main characteristics of the experimental texts.

Text	Readability level	N of signs	N of words	N of sentences
Text 1 'Pushkin'	7,71	202	1520	16
Text 2 'Chekhov'	7,52	198	1446	21
Text 3 'Gorky'	7,62	196	1398	15
Text 4 'Yesenin'	7,71	193	1405	20

Participants

32 students learning Russian as a foreign language (experimental group, female=21, Mage=23, SD=4, B1-B2 level of Russian language defined by the Common European Framework of Reference for Languages) and 32 native speakers of Russian (control group, female=27, Mage=23, SD=8) participated in the experiment.

Procedure

In a four-group experimental design, the participants examined four texts in four different formats. Afterwards, they answered six factual and six analytical questions after each text, identified the keywords, and estimated the subjective difficulty of each text using five scales (from -2 to +2). Text comprehension was also controlled by the cloze-test technique. Every participant examined each format of the text and each biography only once. Each text was presented on the computer screen for 5 min. For the oral format there was an opportunity to listen the audiotext twice. All the stimuli were presented in randomized order. The experiment was carried out through the platform <http://coreapp.ai>. It lasted around 50 minutes for each foreign participant, and around 25 minutes for Russian native speakers.

Results

We used JASP for calculating the statistics (version 0.14.1.0) and the Mann-Whitney U test to compare the results we obtained. We found the factor of format of presentation to be significant for all the experimental texts. We revealed that audiotext is the most challenging text format for both groups of participants. Written text is the easiest and better-perceived format for foreign students. No significant differences were found in processing the text presented in infographics, written form and combined (audio + written) modalities in a group of Russian native speakers (all p s > 0.05). The link to the data is the following: <https://cloud.mail.ru/public/HfFZ/Uknu6NFF5>. The overall results made it possible to build a hierarchy of best-perceived formats for the foreigners: written text — infographics — multimodal text (infographics + audiotext) — audiotext.

Discussion

In the present study, we examined what format of text presentation contributes to more successful information processing and understanding. We found out that audiotext is the most difficult format of presentation. Surprisingly, we revealed that written text is the easiest text format for those who learn Russian as a foreign language. Infographics appeared to be more difficult to process and worse to use for retrieving the essential information. Presumably, these results are due to the difficulties in parallel cognitive processing of graphic and verbal elements (Blinova, Shcherbakova 2019). In the process of perceiving a polycode text, such as infographics, the information contained in it undergoes double decoding: when the image concept is extracted, it is "superimposed" on the verbal text concept, and interaction of the two concepts leads to creation of a single general concept (rendering) of a polycode text, which confirms the idea, that information perceived through different channels, including verbal and iconic, is integrated and processed by a person in a single universal subjective

code of thinking (Zhinkin 1982; Paivio 2006; Fernández-Fontecha et al. 2018). Our results show that the so-called multimedia effect helps to integrate the new information in the cognitive system and to remember, though it is difficult and resource-intensive process, especially for non-native speakers.

Conclusion

Developing the best compromise and form of text presentation in oral and written form becomes especially relevant in connection with the move to remote learning, in which many formats of interaction between the teacher and students involve a combination of auditory and visual modalities. Our research has shown that the text format is among the readability categories (DuBay 2004). Also, we assume that comprehension of a text depends more on the reader's factor than on text format.

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