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LABORATORY FOR EXPERIMENTAL PSYCHOLOGY
FACULTY OF PHILOSOPHY, UNIVERSITY OF BELGRADE

The Role of Grapheme Characteristics on the Processing of Latin and Cyrillic Words

Svetlana Borojević (svetlana.borojevic@ff.unibl.rs)

Laboratory for Experimental Psychology LEP-BL, University of Banja Luka

Strahinja Dimitrijević (strahinja.dimitrijevic@ff.unibl.rs)

Laboratory of Experimental Psychology LEP-BL, University of Banja Luka

Sonja Stančić (sonja.stancic@gmail.com)

Laboratory of Experimental Psychology LEP-BL, University of Banja Luka

Abstract

Bialphabetism is a phenomenon observed in the Serbian language, which refers to the fact that the same word can be written in two alphabetic systems. The aim of this research is to examine the role of grapheme characteristics in the processing of Cyrillic and Latin alphabet. For that purpose, we manipulate with the amount of the available information for the grapheme. Six experimental situations were obtained by combining two factors – alphabet (Cyrillic and Latin) and visual availability of the information (whole word visible, visible upper part or lower part of the word). The lexical decision task was used. 79 students, who first learned Cyrillic alphabet and do not have preferred alphabet, were examined. Within each experimental situation, 60 words (masculine, nominative, singular, six character lengths) and 60 pseudowords were shown. A significant difference was found between experimental situations in the processing time. The results show that the upper part of the Latin graphemes contains the same amount of information needed for processing as the whole graphemes, while the lower part has a very low informative value. The assumption of greater informativity of the upper part of Cyrillic graphemes is not confirmed. These results need to be checked on other types of fonts and different type of letter.

Keywords: bialphabetism, Latin, Cyrillic; grapheme features; visual degradation of a word

Introduction

In Serbian, as in several other languages, there is an unusual phenomenon called bialphabetism. The same word can be written in two alphabetic systems, Latin and Cyrillic, where each letter has its own phonemic interpretation that does not change (Vejnović & Jovanović, 2012). A number of studies examined the differences in the processing of these two alphabetic systems, based mainly on the measurement of the speed and accuracy of reading and recognizing letters (Rot & Kostić, 1986; Ognjenović, Škorc, & Morača, 1995).

There are researches that were based on the processing of complete words (not letters) and they showed certain differences between Latin and Cyrillic words (Vejnović & Jovanović, 2012; Vejnović, Dimitrijević, & Zdravković, 2011; Pašić, 2004; Šokčević, Dimitrijević, & Gvozdenović, 2013). The most common factors for the differences in the processing of these words are stated: a greater exposure to one of two systems (or more frequent use), the order in which

the alphabetic systems are accepted and the visual characteristics of graphemes. The aim of this study is the examination of the role of this third factor.

One way to study this problem is to manipulate the amount of available information. Namely, Huey (1968) claimed that the upper part of the letters or words is more important for processing than their lower part. This regularity has been confirmed in the work of several authors (Blais et al., 2009; Perea, Comesaña, Soares, & Moret-Tatay, 2012; Perea, Comesaña, & Soares, 2012). If the upper parts of words are not visible, the recognition time is significantly longer than the recognition of words where the lower parts are not visually accessible. The question of this research is whether this regularity can be observed in both alphabetic systems of Serbian language.

Method

Sample

The total of 107 participants was examined. All participants were undergraduate students of the University of Banja Luka. The final sample consisted of 60 subjects who first learned Cyrillic alphabet, do not have preferred alphabet in reading or writing and had less than 25% of errors in experimental tasks.

Design and Procedure

There were six experimental situations that were obtained by combining two non-repeated factors: *alphabet* (Cyrillic and Latin) and *visual availability* of information (visible whole word, visible upper part of the word and visible lower part of word).

Within each experimental situation, 120 stimuli (60 words and 60 pseudowords) were shown. Stimuli were 60 nouns (masculine, nominative, singular) of six character lengths and written with Arial font 48. Other 60 stimuli were 60 pseudowords of the same structure as words. Example of stimuli is shown in Figure 1.



Figure 1. Examples of stimuli in the experiment

The lexical decision task was used in the experiment. The reaction time and the number of errors were observed. Participants were randomly assigned to one of the experimental situations and were tested individually. In experimental situations where the lower parts of Latin words were visible, participants have achieved a low accuracy, so this experimental situation has not been considered.

Results

A significant difference between the experimental situations in the reaction time (RT) of the words was found ($F(4) = 141.1, p < .001$). Scheffe post hoc analysis showed that the average RT could be divided into three groups: (1) whole Cyrillic words; (2) whole Latin words and visible upper part of Latin words; (3) visible upper part of Cyrillic words and visible lower part of Cyrillic words (Figure 2). The highest percentage of errors was made in an experimental situation related to Latin words with visible lower parts, so this situation has not been considered in the analysis. A significant effect was also obtained in pseudowords ($F(4) = 486.2, p < .001$), with significant differences in mean RT between all experimental situations (Figure 2).

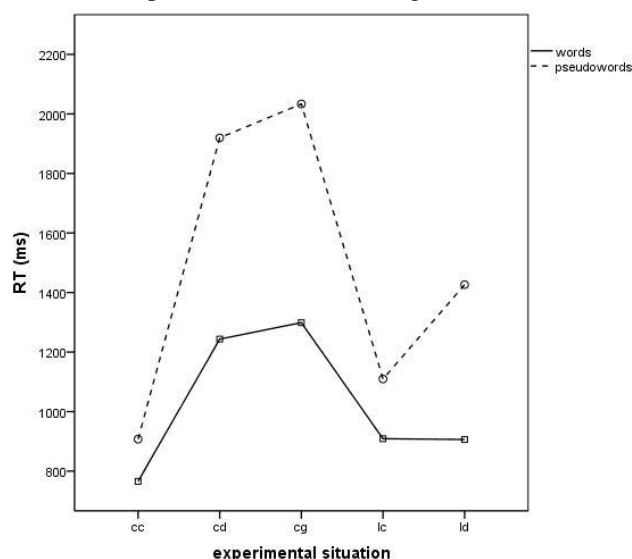


Figure 2. Response latency depending on the *alphabet*, *lexicity* and *type of visual word degradation*. Note: *cc* – visible whole Cyrillic words, *cd* – visible upper part of Cyrillic words, *cg* – visible lower part of Cyrillic word; *lc*

– visible whole Latin words, *ld* – visible upper part of Latin words.

The increment in processing time of words and pseudowords ranges between 75ms and 400ms, depending on the alphabet and visual degradation of graphemes.

Discussion and conclusion

The specificity of the Serbian language is reflected in the possibility of writing the same word in two alphabetic systems – Latin and Cyrillic. But, words written in different alphabets are not processed in the same way (Vejnović, Jovanović, 2012; Vejnović, Dimitrijević, & Zdravković, 2011). This research came from the assumption that these differences are based on the specificity of graphemes. A central point in the examination of graphemes is distinctiveness, a characteristic that one grapheme is easily discriminated in relation to another. Such a process includes the identification of the most prominent features of individual graphemes (Fiset et al., 2008). To investigate this, we manipulated the visibility of the graphemes in words. The criterion for manipulation was a horizontal line that cuts and divides the graphemes on the upper and lower half. In a number of studies, it has been shown that in the different languages (English, Spanish, French, Chinese) advantage in reading have the upper parts of words (Bias et al., 2009; Perea, 2012; Perea et al., 2012; Shimron & Navon, 1980; Tsao & Wang, 1983). This can be explained by upward-balanced word and more critical information in upper parts of single grapheme (Tejero, Perea & Jiménez, 2014).

The results obtained in this study in the Serbian language partly deviate from the regularity established in other languages. Experimental degradation of Cyrillic words slows down processing time and does not confirm the assumption of greater informability of the upper part of graphemes in words. In the Latin alphabet, the results show that the upper parts of graphemes contain the same amount of information needed for processing as the whole graphemes, while the lower parts have a very low informative value. One possible explanation of these results is based on line terminations. Fiset et al. (2008; Blais et al, 2009) have found that this ends of letter parts are the most important features for its visual identification. Line terminations are clear indicators of the lack of curvatures and absence of intersections, which makes it easier to recognize graphemes. The differences between Latin and Cyrillic alphabets could be based on the number of line terminations, especially in the upper parts. Latin graphemes have fewer line terminations (mostly one) in the upper half in relation to Cyrillic graphemes. Also, the Latin graphemes have a certain number of specific extensions in the upper parts (č, ć, š, ž) that makes them easily recognizable. Likewise, the lower parts of a large number of Latin graphemes have the same form which is why they are hard to distinguish. On the other hand, for efficient processing in the Cyrillic alphabet, visual availability of complete graphemes is necessary.

The results obtained in this study need to be checked on other types of fonts (e.g. serif fonts) as well as on a different type of letter (written or capital).

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