

Eye-tracking Study of Emotional Text Processing in Turkic-Russian Bilinguals: Effects of Text Emotional Colouring and Participant's Level of Alexithymia

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Emotions shape cognitive processes like memory, attention, and decision-making, which in turn affect language use and comprehension [Van Berkum, 2022]. In text processing, the reader's cognitive profile matters, and here we focus on alexithymia marked by limited imagination, utilitarian thinking, and difficulty verbalizing emotions which likely shapes how readers engage with text [Luminet et al., 2021]. In bilingual reading, L2 status adds another layer of complexity, leading us to ask: 1) Does emotional colouring of the text influence the speed of its processing among early Turkic-Russian bilinguals when reading in their L2? 2) What role does alexithymia play in text processing in bilinguals?

Method and Material. As studies of text-level emotional processing which utilize eye-tracking are still limited compared to word-level processing and there are no well-established methods, we propose a new paradigm which combines reading and emotion annotation: on the experiment screen there is a text and the annotation area below it with 6 scales allowing to measure the level of 6 basic emotions (happy, sad, disgust, fear, surprise and anger) from 0 to 5. A participant firstly reads the text, then chooses the emotions this text contains using the scales. While doing so, their eye movements are recorded. In addition to oculomotor data participants complete alexithymia test (TAS-20) [Bagby et al., 1994], Bilingual Language Profile questionnaire [Birdsong et al., 2012], and a mood assessment questionnaire. Stimulus **material** of this study includes 35 short narrative social media texts in Russian that express one of the 6 basic emotions + 5 emotionally neutral texts (according to preliminary annotation conducted by 3 monolingual Russian speakers).

Participants. Experimental sample comprises 45 Turkic-Russian bilinguals and trilinguals (mean age 20.2; 35 females) from southern Kazakhstan, all with L2 Russian. Trilingual informants (N = 18) have Uzbek, Turkmen or Turkish as L1; they acquired Russian between ages 0–11 and also speak Kazakh as L3 though with different proficiency. Bilinguals have Kazakh as L1 and acquired Russian from birth or early childhood. All participants have been in bilingual environment since childhood.

Results. For the analysis we defined several regions of interest (ROIs) to extract eye-tracking metrics. ROI 1: text area, metrics – mean fixation duration, first reading time before proceeding to annotation, total reading time; ROI 2: annotation area, metric – total fixation duration of each scale; ROI 3: the whole screen, metric – number of regressive saccades from annotation area back to the text. Here we would like to focus on several of them as well as on the results of text annotation. For the eye-tracking metrics analysis we used linear mixed-effect models, for annotation – cumulative link mixed models due to ordinal nature of the data.

Firstly, there was no stable significant main effect of text emotional colouring in the text-level eye-tracking measures which supports the hypothesis that bilinguals' L2 may be less emotionally rich and thus there is no preference for valenced stimulus compared to neutral ones. Interestingly, there was local effect for sad texts: first reading time for sad texts were shorter than for neutral text ($\beta = -6.5065$ (in sqrt scale), $SE = 3.2085$, $p = 0.0428$).

However, we found a significant effect of alexithymia on mean fixation duration ($\beta = -0.0599$ (in log scale), $SE = 0.0240$, $p = 0.0127$): participants with higher alexithymia scores had shorter fixation duration while reading the texts than participants who had normal

alexithymia levels. It is suggested that alexithymia is associated with less frequent reading and even reading avoidance because of the lack of the capacity and motivation to understand the inner thoughts and feelings of the narrator and the characters in a text [Samur et al., 2017]. Shorter fixation durations experimentally support this idea as may signal lower cognitive engagement in reading emotionally charged first-person stories.

Alexithymia level also influenced the way participant annotated the texts. Compared to oculomotor behavior which reflects automatic processing, annotation is the product of conscious emotional reflection. The most pronounced effect was for anger detection. We found that the higher participant scored on externally oriented thinking facet in TAS-20 test, the lower their estimates of anger were. In other words, bilinguals with a cognitive style characterized by a pragmatic, literal, and concrete focus on external events coupled with a relative lack of attention to exploration of one's own inner emotional world demonstrated lower ability of anger detection. These results are in line with other experimental findings which suggest that alexithymia disrupts the automatic processing of potentially threatening stimulus such as angry faces [Vermeulen et al., 2006].

Conclusion. This research suggests a new experimental paradigm to study emotional text processing which allows to register both automatic and conscious levels of emotional information processing. In this research iteration we did not find that emotional colouring of the text influences L2 text processing in Turkic-Russian bilinguals. Valuable results were obtained for alexithymia and its influence on both oculomotor behavior and conscious processing of emotional information: mean fixation duration may be considered a text-level predictor of lower narrative engagement caused by high alexithymia level. Our findings also show that individuals with alexithymia tend to adopt an avoidance strategy when processing negatively valenced, threat-related emotional information. While such avoidance has previously been demonstrated using pictorial stimuli, our study extends this evidence to the domain of textual narrative, providing convergent support for the phenomenon in a linguistically mediated context.

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