

Oculomotor resonance during processing past and future tense in Russian and Hebrew

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Introduction

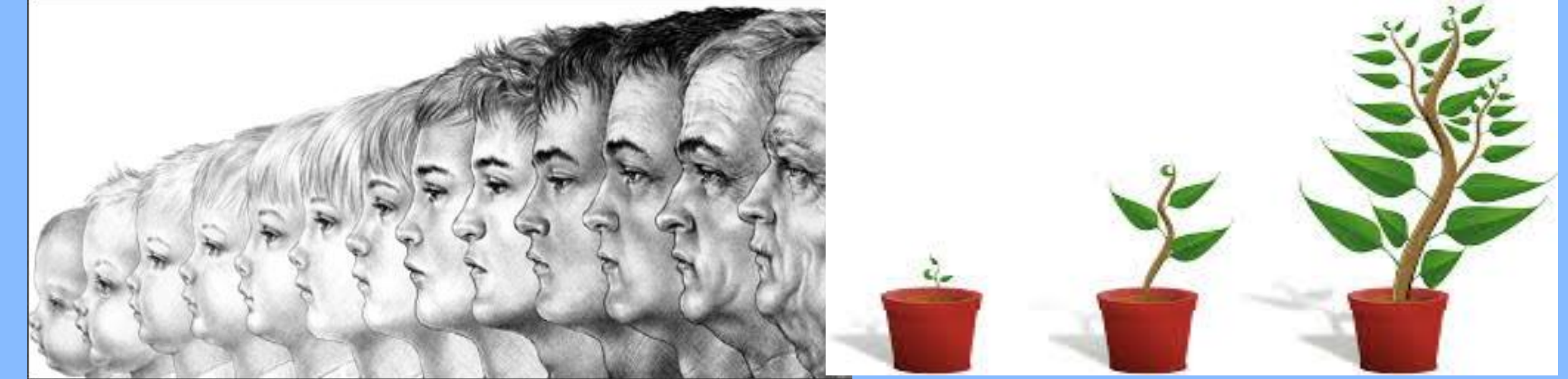
- The influence of the direction of writing on how time and space are represented in the consciousness of the native speakers of this language;
- Similar studies with native speakers of Russian were not conducted;
- The study is innovative;
- Analytical information, namely - the relationship of the space-time representation of grammatical forms with the direction of writing in Russian and Hebrew;

Background

This work is based on different theories. Among them, the theory of "embodied cognition" (Barsalou, 2008; 2010) and the model of spatio-temporal interrelation in the language (Boroditsky, 2011; Levinson, 1992), connected with the study of space-time constructions in the languages of the world. Previous research (Boroditsky, 2011) has shown that speakers of languages with left-to-right writing systems map time on the left-to-right axes, with earlier events mapped on the left. In this study, we tested spatial biases in processing linguistically encoded time - past and future tensed verbs.

Hypotheses

The influence of writing in the language on the mapping of temporal forms consisted in the fact that when people hear verbs in the past form, they often look to the left, and when they hear verbs in non-past form - to the right. In accordance with the direction of writing in the language.



Stimuli

The materials were previously normalized (verbs should have a motor meaning and do not differ in length. The verbs with some abstract meaning were not allowed for the experiment. Verbs and noun-fillers were distributed on 4 presentation sheets in such a way that the same participant did not see duplicate words.
• 90 fillers were added to the experimental verbs.

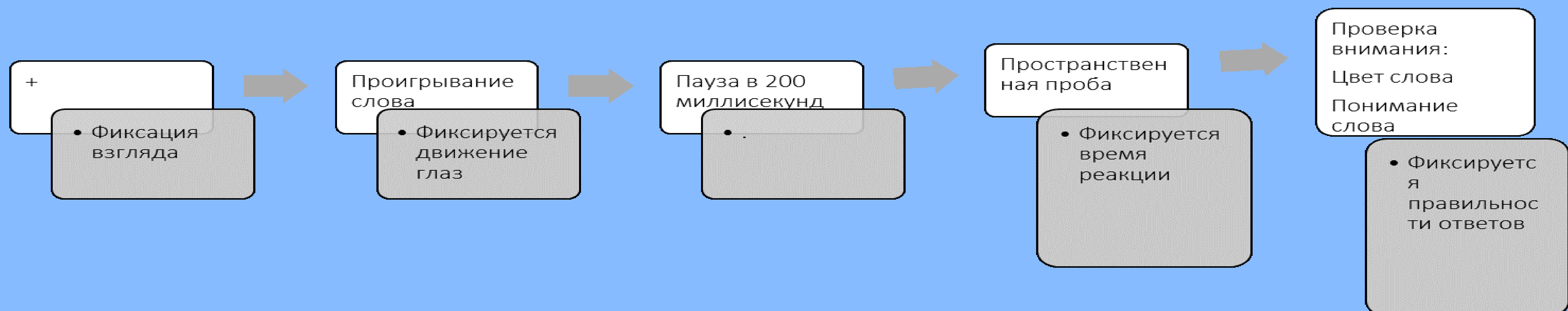
Participants

- 62 native speakers of Russian, a language written from left to right, and 62 speakers of Hebrew, a language written from right to left, participated in an eye-tracking experiment. The same method and procedure was used for both experiments in this study.
- Age of participants from 18 to 45 years
- Participants were tested on the EyeLink 1000+

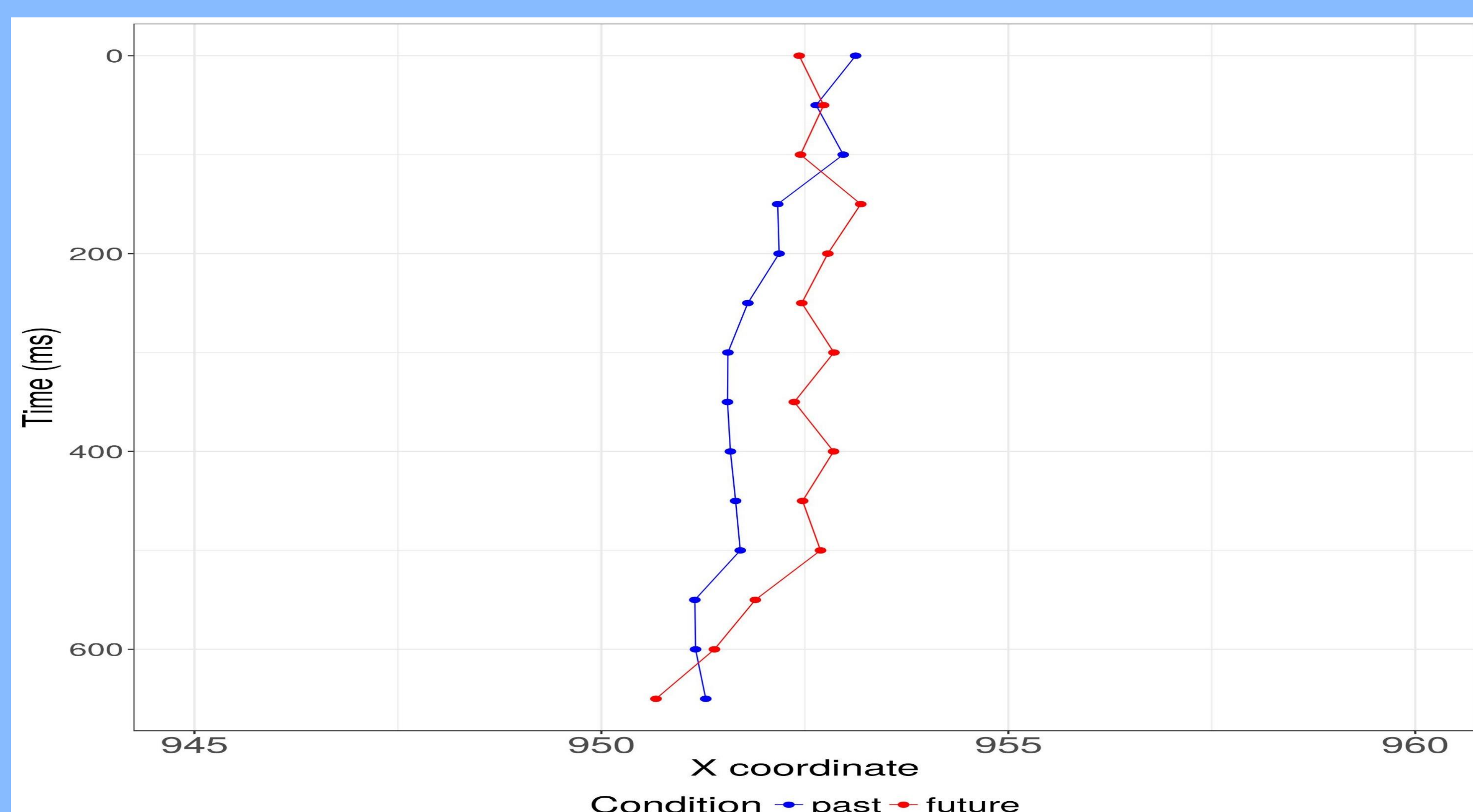
Method

- After looking at a fixation cross in the middle of the screen, a participant heard a verb or a filler noun. Two seconds after the word onset, a visual spatial probe appeared in one of the five locations: center, left, right, top, or bottom of the screen. The participant had to press one of the five corresponding buttons on the gamepad to indicate the location of the spatial probe.

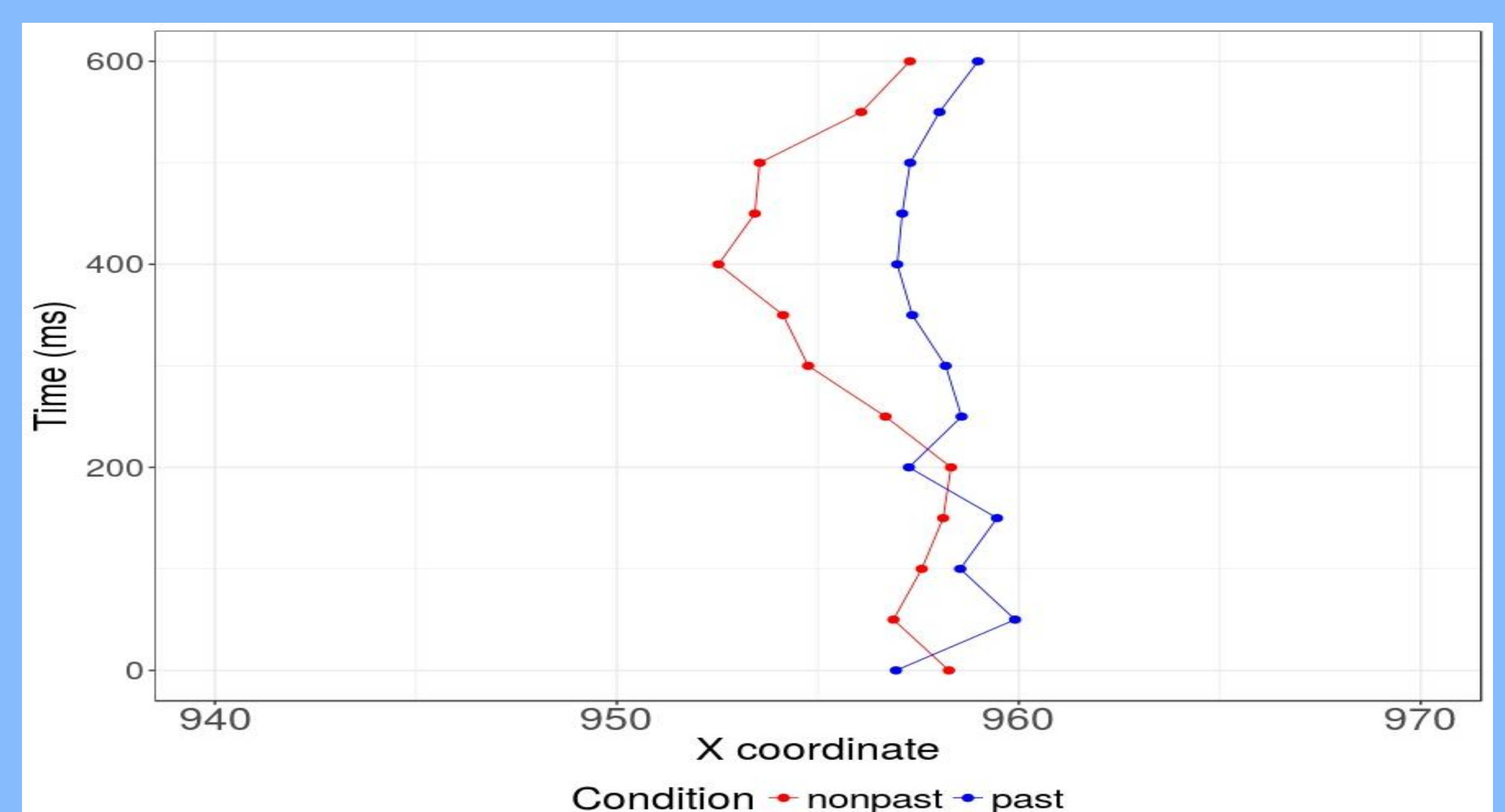
The structure of the sample and the sequence of elements in the experiment.



Ocular drift associated with processing past and future tense (Russian)



Ocular drift associated with processing past and future tense (Hebrew)



Analysis and results (Russian)

- For Russian, gaze coordinates were shifted to the left for past in comparison to non-past (future) verb forms (Est.= -0.29, SE=0.13, t=-2.3). No significant effects on the y axis and regarding the spatial probe task were found.

Conclusion

These results confirmed our hypothesis about the influence of the direction of writing on spatial orientation: Russian speakers conceptualize past on the left and the Hebrew speakers conceptualize past on the right. The results provide evidence for oculomotor resonance during processing temporal semantics expressed through tensed verb forms.

Analysis and results (Hebrew)

- For Hebrew, gaze coordinates were shifted to the right for verbs in the past tense as compared to non-past (95% credible interval: [0.41, 2.01 px]) No significant effects on the y axis and regarding the spatial probe task were found.