

# Impact of fatigue on spatial language and cognition

Evija Ziba<sup>1</sup>, Jurgis Skilters<sup>2</sup>, Vsevolod Liakhovetckii<sup>1,3</sup>,  
Gunta Krumina<sup>1</sup>

<sup>1</sup>University of Latvia, Department of Optometry and Vision Science

<sup>2</sup>University of Latvia, Center for the Cognitive Sciences and Semantics, Riga, Latvia

<sup>3</sup>Pavlov Institute of Physiology, Russian Academy of Sciences, St.Petersburg, Russia

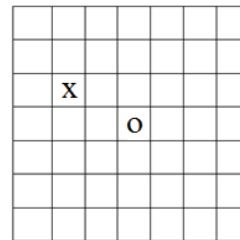
## Introduction

In the present study we examined relationship between fatigue and spatial language. Although fatigue impacts various perceptual and cognitive processes, there are no studies exploring the relationship between fatigue and spatial language. There are also no studies on the representation of spatial relations in Latvian. The goal of our study was to evaluate the effect of fatigue on the spatial language. The main tasks was:

- to compare language-specific properties in Latvian and English spatial prepositions;
- to discover possible differences between the results when conducting experiment at different times of the day,
- to find possible differences in spatial perception in the conditions of fatigue.

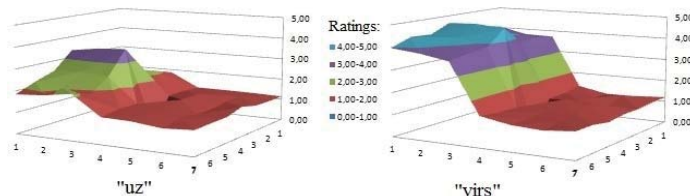
## Methods

We used the acceptability rating task with Latvian spatial prepositions. Picture with configuration of spatial objects and a corresponding sentence were shown on computer screen. Subjects were asked to rate how good the sentence describes the picture. Subjects rated also their fatigue before and after the test and answered some general questions about health, wake-up time etc.

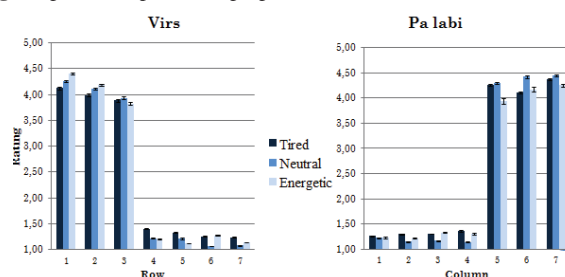


**Fig.1.** 7x7 grid illustrating possible located object placement in the acceptability rating task.

## Results



**Fig.2.** Spatial templates for prepositions "virs" (above) and "uz" (on).



**Fig.3.** Goodness ratings for prepositions "virs" (above) and "pa labi" (right of).

It was proper that tired subjects choose less acceptable ratings for prepositions "virs" (above) and "uz" (on), but for prepositions "zem" (under), "tuvu" (next to) and "pa labi" (to the right) fatigued subjects choose more acceptable ratings. *Logan and Sadler* (1996) in their study elaborated spatial templates for ten English prepositions. They determined the regions corresponding to good, acceptable and bad examples of each preposition. Results in present study in Latvian support *Logan and Sadler's* findings. The only difference is in case of Latvian prepositions "virs" and "uz" having different meanings than the corresponding prepositions in English. The region of acceptability is very small in case of "uz" (on) which is different from the initial English version of the test.

## Conclusions

1. The effect of fatigue on the spatial perception differs according to the meaning of preposition.
2. According to the data analysis we cannot observe any impact of the daytime (when the test is conducted) on the test results.

## Reference

Logan, G. D., Sadler, D. D., A Computational Analysis of the Apprehension of Spatial Relations, In: Language and Space (P.Bloom, M.A.Peterson, L.Nadel and M.Garret Eds.) MIT Press, Cambridge, p.493-529

## Acknowledgment

This study is supported by ESF project No.2013/0021/1DP/1.1.1.2.0/13/APIA/VIAA/001.