Practice makes perfect – effect of repetitive visual stimulation on the response intensity in the rat visual system.

Vision is our most precious special sense. Nearly half of the human brain is involved in vision process. Thus, when the brain is damaged, the probability of visual impairments is high and the consequences for quality of life are grave. It was long suspected that the brain had no capability of repair visual function but now we know that visual loss doesn't remain unchanged. One fundamental approach to enhance plasticity potential in the visual system is behavioral stimulation through repetitive sensory experience. Phenomenon of experience-dependent plasticity is well documented in primary visual cortex in both humans, primates and rodents (Furmanski et al., 2004; Frenkel et., 2006; Cooke and Bear, 2010). Repeated exposure to specific sensory stimuli can persistently modify the brain to improve perception of these stimuli. Training of visual functions by repetitive presentation of visual stimuli in either the intact regions of the visual field, partially damaged areas or even totally damaged areas of the visual field which still receive input from surviving visual pathways is a common tool used in the rehabilitation of patients with visual impairments. Another approach in the restoration of visual function turns out to be the electrical stimulation. There are animal studies that indicate a neuroprotective effect of transcorneal electrical stimulation on survival retinal ganglion cells or photoreceptors in the traumatic optic neuropathy (Morimoto et al., 2007; Hanif et al., 2016) as well as humans studies showing improvement in visual perception following sessions with transorbital current stimulation [Gall et al., 2016].

In our study we have attempt to invastigate the effect of repetitive visual training on the magnitude of the visual evoked potential (VEP) in the main visual structures: primary visual cortex (VCx), superior colliculus (SC) and dorsolateral geniculate nucleus (dLGN) in in anesthetized rats. We observed that repetitive visual stimulation enhanced visual responses in all recorded structures. Additionally, we verified that effectiveness of visual training depends on the number of series of repetitive stimulus presentation.

I will also present plans of our future studies which will concern the use of visual training and noninvasive current stimulation for recovery of visual function in experimental model of glaucoma in rat.