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Investigating Normal and Deficient Visual Functions

Position

Associate Professor, Sackler Faculty of Medicine

Research

Our research focuses on function, development and plasticity of perceptual interactions in normal and abnormal visual cortex. In our research, we have revealed a unique pattern of neural interactions, both excitatory and inhibitory, underlying global behavior involved in contour integration and texture segmentation. Specifically, a network of long-range intra-cortical connections supporting integration of collinear elements of the visual input is characterized beyond its spatial properties, especially emphasizing the temporal dynamics. Using of training protocols based on spatial and temporal masking paradigms is another area of interest. Studies on the effects of perceptual learning on visual function are conducted, including cases of abnormal visual development, considered as untreatable, such as amblyopia.

The laboratory combines techniques such as psychophysics, visual evoked potentials (VEP), event-related potentials (ERP) and eye movement recording. Computational modeling of neural networks of long-range interactions provides theoretical framework for our empirical findings.

Ongoing studies:

Clinical: Amblyopia, Major depression, ADHD, Pharmacological effects on vision, Vision in eye diseases

Development: Visual acuity, Contrast sensitivity, Lateral interactions, Visual crowding, Contour integration, Visual grouping

Learning: Learning to see faster, Improvement of normal vision, Improvement of impaired vision, Adaptation vs. learning, Visual rehabilitation, Refraction plasticity, Visual Performance

Visual performance: Night vision, Driving, Color blindness, Aging, Binocular vision, Visual masking, Peripheral vision, Tracking eye movements, Video game playing, Decision making, Visual stress, Fatigue.

Publications

Hirshler- Kotner, Y., **Polat, U.**, Biegon, A., (2010) Intracranial electrode implantation produces regional neuroinflammation and memory deficits in rats. *Experimental Neurology* 222, 42-50.

Katz, G., Levkovitch-Verbin H., Triester G., Belkin M., Ilany J., **Polat U.** (2010) Mesopic Foveal Contrast Sensitivity is Impaired in Diabetic Patients Without Retinopathy. *Graefes Arch Clin Exp Ophthalmol.* 248, 1699-1703

Lahav K., Levkovitch-Verbin H., Belkin M., Glovinsky Y., **Polat U.** (2011) Reduced foveal photopic and scotopic contrast sensitivity in glaucoma. *Arch Ophthalmol.* 129, 16-22.

Yehezkel O., Sterkin A., Sagi D., **Polat U.**, (2010) Learning to adapt: Dynamics of readaptation to geometrical distortions. *Vision Res*, 50, 1550-1558.

Li R., **Polat U.**, Scalzo F., Bavelier D. (2010) Reducing backward masking through action game training. *Journal of Vision* 10.

Cohen, Y., Belkin, M., Yehezkel, O., **Polat, U.** (2011) Dependency between Light Intensity and Refractive Development under Light-Dark Cycles. *Exp. Eye Res.* 92, 40-6.

Amiaz, R., Zomet, A., **Polat, U.** (2011) Excitatory Repetitive Transcranial Magnetic Stimulation over the Dorsolateral Prefrontal Cortex does not Affect Perceptual Filling-in in Healthy Volunteers. *Vision Res*, 51, 2071-2076.

Sterkin, A., Yehezkel, O., **Polat, U.**, Learning to be fast: gain accuracy with speed (2011) *Vision Res*, 50,1550-1558

Lev, M., **Polat, U.** Collinear facilitation and suppression at the periphery (2011) *Vision Res*, 51:2488-2588.

Polat, U., Schor, C., Tong, J.L., Zomet, A., Lev, M., Yehezkel, O., Sterkin, A., Levi, D. (2012) Training the brain to overcome the effect of aging on the human eye. *Scientific Reports*, 2.

Cohen, Y., Peleg, E., Belkin, M., **Polat, U.**, Solomon, A., (2012) Ambient Illuminance, retinal dopamine release and refractive development in chicks. *Exp. Eye Res.* 103:33-40.