Visual perception

The psychological process of visual information is known as visual perception, a lack of which is called blindness. Non-image-forming visual functions, independent of visual perception, include the pupillary light reflex (PLR) and circadian photoentrainment.

Binocular rivalry has been widely studied as a tool for investigating various aspects of visual perception and neural processing. It is used in research to gain insights into the mechanisms of visual perception, attention, and consciousness. Additionally, it has been used to study the functions of different brain regions involved in vision and to explore conditions where binocular rivalry may be altered, such as in certain neurological and psychiatric disorders.

Patients with Parkinson's disease (PD) frequently suffer from visual misperceptions and hallucinations, which are difficult to objectify and quantify.

Miloserdov et al. aimed to develop an image recognition task to objectify misperceptions and to assess performance fluctuations in PD patients with and without self-reported hallucinations. Thirty-two non-demented patients with Parkinson's disease (16 with and 16 without self-reported visual hallucinations) and 25 age-matched healthy controls (HC) were tested. Participants performed a dynamic image recognition task with real and scrambled images. They assessed misperception scores and intra-individual variability in recognition times. To gain insight into possible neural mechanisms related to misperceptions and performance fluctuations thery correlated resting state network connectivity to the behavioral outcomes in a subsample of Parkinson's disease patients (N = 16). They found that PD patients with self-reported hallucinations (PD-VH) exhibited higher perceptual error rates, due to decreased perceptual sensitivity and not due to changed decision criteria. In addition, PD-VH patients exhibited higher intra-individual variability in recognition times than HC or PD-nonVH patients. Both, misperceptions and intra-individual variability were negatively correlated with resting state functional connectivity involving frontal and parietal brain regions, albeit in partly different subregions. Consistent with previous research suggesting that hallucinations arise from dysfunction in attentional networks, misperception scores correlated with reduced functional connectivity between the dorsal attention and salience network. Intra-individual variability correlated with decreased connectivity between somatomotor and right fronto-parietal networks. We conclude that our task can detect visual misperceptions that are more prevalent in PD-VH patients. In addition, fluctuating visual performance appear to be a signature of PD-VH patients, which might assist further studies of the underlying pathophysiological mechanisms and cognitive processes [1)].

1)
Miloserdov K, Schmidt-Samoa C, Williams K, Weinrich CA, Kagan I, Bürk K, Trenkwalder C, Bähr M, Wilke M. Aberrant functional connectivity of resting state networks related to misperceptions and intra-individual variability in Parkinson's disease. Neuroimage Clin. 2019 Nov 5;25:102076. doi: 10.1016/j.nicl.2019.102076. [Epub ahead of print] PubMed PMID: 31794926.