

Spatial navigation in virtual reality - from animal models towards schizophrenia Spatial cognition tests based on animal research

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Abstract

Schizophrenia is manifested in positive, negative and cognitive symptoms. Especially, the cognitive symptoms offer useful methodological approach for comparative studies using spatial navigation tasks in both, schizophrenia patients and animal models of cognitive deficit in schizophrenia. In order to demonstrate the deficit of spatial cognition in schizophrenia and to test the validity of pharmacological model, we designed two virtual tasks inspired by previous animal research: the virtual Morris water maze and Carousel maze. The newly-designed tasks require the tested subject to navigate toward several hidden goal positions placed on the floor of an enclosed stable arena or on a rotating arena. Data obtained in a group of schizophrenia patients and matched group of healthy volunteers show cognitive impairment in first episodes of schizophrenia using both, standardized neurocognitive methods and newly-developed virtual tests. The virtual test batteries show different involvement of navigation strategies and different level of impairment in schizophrenia patients. These findings indicate usefulness of these virtual methods in future cognitive remediation. Despite the fact, that both virtual tasks test spatial navigation towards hidden goal, obtained results are divided into partly different clusters using PCA, while performance parameters measured in the stable arena form a cluster mostly with tests of memory and executive functions; the rotating arena seems to be more related to performance tests dependent on timing, psychomotor speed and mental flexibility.

Keywords

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