

Author's Accepted Manuscript

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PII: S0165-1781(17)31101-0
DOI: <https://doi.org/10.1016/j.psychres.2018.01.036>
Reference: PSY11163

To appear in: *Psychiatry Research*

Received date: 15 June 2017
Revised date: 15 January 2018
Accepted date: 15 January 2018

Cite this article as: Claudia De Sanctis, Gian Carlo Bellenchi and Davide Viggiano, A meta-analytic approach to genes that are associated with impaired and elevated spatial memory performance, *Psychiatry Research*, <https://doi.org/10.1016/j.psychres.2018.01.036>

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A meta-analytic approach to genes that are associated with impaired and elevated spatial memory performance

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Abstract

Spatial memory deficits are a common hallmark of psychiatric conditions, possibly due to a genetic predisposition. Thus, unravelling the relationship between genes and memory might suggest novel therapeutic targets and pathogenetic pathways. Genetic deletions are known to lead to memory deficits (post-deletion “forgetfulness” genes, PDF), or, in few instances to improve spatial memory (post-deletion “hypermnestic” genes, PDH). To assess this topic, we performed a meta-analytic approach on memory behaviour in knock-out mice. We screened 300 studies from PubMed and retrieved 87 genes tested for possible effects on spatial memory. This database was crossed with the Allen Brain Atlas (brain distribution) and the Enrichr (gene function) databases. The results show that PDF genes have higher expression level in several ventral brain structures, particularly the encephalic trunk and in the hypothalamus. Moreover, part of these genes are implicated in synaptic functions. Conversely, the PDH genes are associated to G-protein coupled receptors downstream signalling. Some candidate drugs were also found to interfere with some of the PDH genes, further suggesting that this approach might help in identifying drugs to improve memory performance in psychiatric conditions.

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