

The Next Generation's Learning Ability, Memory, as Well as Cognitive Skills Is under the Influence of Paternal Physical Activity (An Intergenerational and Trans-Generational Effect): A Systematic Review and Meta-Analysis

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Abstract : Background: It is well established that parents can influence their offspring's neurodevelopment. It is shown that paternal environment and lifestyle is beneficial for the progeny's fitness and might affect their metabolic mechanisms; however, the effects of paternal exercise on the brain in the offspring have not been explored in detail. Objective: This study aims to review the impact of paternal physical exercise on memory and learning, neuroplasticity, as well as DNA methylation levels in the off-spring's hippocampus. Study design: In this systematic review and meta-analysis, an electronic literature search was conducted in databases including PubMed, Scopus, and Web of Science. Eligible studies were those with an experimental design, including an exercise intervention arm, with the assessment of any type of memory function, learning ability, or any type of brain plasticity as the outcome measures. Standardized mean difference (SMD) and 95% confidence intervals (CI) were computed as effect size. Results: The systematic review revealed the important role of environmental enrichment in the behavioral development of the next generation. Also, offspring of exercised fathers displayed higher levels of memory ability and lower level of brain-derived neurotrophic factor. A significant effect of paternal exercise on the hippocampal volume was also reported in the few available studies. Conclusion: These results suggest an intergenerational effect of paternal physical activity on cognitive benefit, which may be associated with hippocampal epigenetic programming in offspring. However, the biological mechanisms of this modulation remain to be determined.

Keywords : hippocampal plasticity, learning ability, memory, parental exercise

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