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学位の種類	博士 (医学)
報告番号	甲第2020号
学位記番号	第1425号
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授与年月日	令和6年3月22日
学位論文の題名	<p>The defects of the hippocampal ripples and theta rhythm in depression, and the effects of physical exercise on their amelioration (運動による鬱症状改善のためのリハビリテーション介入標的の探索)</p> <p>Heliyon, Dec 16; 10(1): e23738, 2023</p>
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Abstract

Adverse environmental stress causes depressive symptoms with the impairments of memory formation, cognition, and motivation, however, their underlying neural bases have not been well understood, especially based on the observation of living animals. Among the hippocampal activities associated with functions such as memory, cognition, and motivation, which were previously reported to be impaired in depression, sharp wave ripples (SWRs) and theta rhythm are included. In the present study, therefore, the mice model of restraint-induced stress was examined electrophysiologically to investigate the alterations of hippocampal SWRs and theta rhythms. In addition, the therapeutic effects of physical exercise on the amelioration of those hippocampal impairments were examined in combination with a series of behavioral tests. The data demonstrated that chronic restraint stress caused the reductions of occurrence and amplitude of hippocampal SWRs and the decreases of occurrence, duration, and power of theta rhythms, while physical exercise significantly reverted them to the levels of healthy control. Furthermore, hippocampal adult neurogenesis and microglial activation, previously reported to be involved in the etiology of depression, were histologically examined in the mice. The results showed that the impairment of neurogenesis and alleviation of microglial activation were induced in the depressed mice. On the other hand, physical exercise considerably ameliorated those pathological conditions in the affected brain. Consistently, the data of behavioral tests in mice suggested that physical exercise ameliorated the symptomatic defects of motivation, memory formation, and cognition in the depressed mice. The impairments of hippocampal SWRs and theta rhythms in the affected hippocampus are linked with the symptomatic impairments of cognition and motivation, and the defect of memory formation, respectively, in depression. Taken together, this study demonstrated the implications of impairment of the hippocampal SWRs and theta rhythms in the etiology of depression and their usefulness as diagnostic markers of depression.