

# Pengaruh olahraga aerobik halang rintang terhadap fungsi kognitif ditinjau dari homeostasis oksidatif, angiogenesis, dan neuroplastisitas otak mencit dewasa = The effects of hurdle aerobic exercise in brain's oxidative, homeostasis, angiogenesis, neuroplasticity, and cognitive ability of middle aged mice

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## Abstrak

Olahraga aerobik terbukti mampu meningkatkan struktur dan fungsi kognitif. Data tentang jenis olahraga aerobik yang terbaik untuk menjaga keseimbangan oksidatif, serta memicu angiogenesis dan neuroplastisitas di berbagai regio otak masih terbatas. Penelitian ini menganalisis pengaruh olahraga aerobik halang rintang terhadap kadar neuroglobin otak, protein pemicu angiogenesis, neuroplastisitas di hipokampus dan korteks prefrontal, serta fungsi memori relasional. Mencit *Mus musculus* CBS-Swiss strain jantan berusia 10 bulan dilatih berlari di roda berjalan yang diberi halang rintang, berlari dengan kecepatan 10 m/menit, 30 menit/hari, 5 hari/minggu sambil melewati halang rintang untuk setiap 78 cm. Tiga jenis halang rintang diganti setiap 3 hari. Kelompok pembanding adalah mencit yang berlari dengan kecepatan dan waktu yang sama, namun tanpa halang rintang, serta kelompok kontrol yang tidak berolahraga. Kadar neuroglobin otak tidak berbeda bermakna pada tiga kelompok mencit. Latihan lari halang rintang memberikan efek lebih baik dibanding lari tanpa halang rintang pada kadar developmentally regulated brain protein-A (drebrin-A) di hipokampus. Kedua kelompok olahraga memiliki efek yang lebih baik dibanding kontrol pada ekspresi vascular endothelial growth factors (VEGF), kadar drebrin-A, dan paired associative cognitive test. Olahraga aerobik kompleks memicu neuroplastisitas yang lebih baik dibanding aerobik sederhana di hipokampus. Kedua tipe olahraga aerobik mampu meningkatkan angiogenesis dan neuroplastisitas di otak, dan meningkatkan kemampuan memori relasional. Olahraga aerobik tidak meningkatkan kadar neuroglobin secara bermakna. Hal ini menunjukkan bahwa intensitas olahraga aerobik memberikan efek hipoksia yang dapat ditoleransi oleh jaringan otak.

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Aerobic exercise has been proven to improve of cognitive structure and function. Study about the type of aerobic exercise affects on angiogenesis, neuroplasticity and oxidative homeostasis in brain's specific regions is still limited. The present study was conducted to investigate the effects of hurdle aerobic exercise on brain neuroglobin level, angiogenesis and neuroplasticity proteins in hippocampus and prefrontal cortex, and relational memory among middle aged CBS-Swiss strain mice. Mice, age 10 months were subjected to hurdle running wheel for 8 weeks. They ran at speed of 10 m/min, 30 min/day, and 5 days/week with hurdles for every 78 cm. Three types of hurdles were changed for every 3 days. Another group of same age mice ran at same speed, time, and period, without hurdle as comparison, while other control group never exercises. The hurdle group exercise has significant higher level of developmentally regulated brain protein-A (drebrin- A) in hippocampus compared to non-hurdle group. Both of exercise groups have significant higher ability on paired associative cognitive test, and they have significant higher expression of vascular endothelial growth factor (VEGF) and higher level of drebrin-A compared to control. Neuroglobin level was not significant different among of all groups. More complex aerobic exercise has better effect on

hippocampus neuroplasticity. Both of aerobic exercise has better effect on angiogenesis and neuroplasticity in the brain, and also on cognitive function. Aerobic exercise does not resulting high hypoxic stress and could be tolerated by brain.