

2-B-05 Comparison of spontaneous and forced running on the hypothalamic gene expression using microarray and Medical Subject Headings analysis

Shinya YANAGITA^{1, 2}, Masakazu UMEZAWA², Ken TAKEDA²

1 Faculty of Science and Technology, 2 Research Center for Environmental Health Science of Next Generation, Tokyo University of Science

Purpose: Recent studies have shown that spontaneous running and forced running have different effects on brain functions. In this study, we focused on the effects of spontaneous and forced running on expression of numerous genes in the hypothalamus by microarray. Furthermore, we performed the methods for functional analysis of microarray data using Medical Subject Headings (MeSH) term produced by the National Library of Medicine (USA).

Methods: Male Wistar rats were randomly assigned to 3 groups: spontaneous running (S), forced running (F) and locked wheel control (L). The rats of S and F performed 60mins running by free-moving or motor driving running wheel, respectively. Immediately after the running session, the brains were removed, and tissue samples of the hypothalamus were dissected for microarray analysis. Following RNA extraction, cDNA microarray was performed according to manufactured kits and protocols (consisting 58717 gene probes; Agilent Technologies).

Results: Present microarray analysis detected the expression levels of 12770 genes. The expression levels of 475 genes (upregulation 215; downregulation 260) were changed significantly in the hypothalamus on the comparison of S vs. F, and those of 634 genes (upregulation 303; downregulation 331) were changed significantly on the comparison of S vs. L. MeSH analysis revealed that these dysregulated genes were enriched in motivation, nerve growth factor, motor activity, stress or anxiety.

Discussion: Present results suggest that spontaneous wheel running has specific effects for the hypothalamic gene expressions, and microarray and MeSH analysis can characterize the effects of different types of physical exercise on brain functions.

Keyword: spontaneous running, microarray, MeSH

2-B-06 The effect of exhaustive exercise on automatic visual-change detection process in the central nervous system

Takuro HIGASHIURA¹, Yoshiaki NISHIHARA², Kuninori HAYASHI², Yuuka HAYASHI², Arihiro HATTA³

¹Sports Research & Development Core, University of Tsukuba, ²Graduate School of Comprehensive Human Sciences, University of Tsukuba, ³Yokohama College of Pharmacy

Purpose: The influence of exhaustive exercise on automatic visual-change detection process in the central nervous system was investigated using the visual mismatch negativity (vMMN).

Methods: Undergraduate and graduate students (n = 10) participated in the study. This experiment consisted of control condition without cycle exercise and exhaustive exercise conditions. The two conditions were randomly conducted on a different day. In the vMMN task, one of squares presented in a monitor was randomly lit up red with an inter-stimulus interval of 1 s. The probabilities of standard (the square in the center of monitor) and deviant stimulus (the squares in the left or right side of monitor) were 80% and 20%, respectively. Each participant ignored visual stimulus, and attended popular music delivered through headphone.

Results: vMMN latency in the exhaustive exercise condition prolonged than that in the control condition. vMMN amplitude in the exercise condition tended to decrease than that in the control condition.

Discussion: These findings suggest that exhaustive exercise deteriorates automatic visual-change detection process in the central nervous system. This negative effect may be caused by fatigue following the exhaustive exercise.

Keywords: automatic visual-change detection process, visual mismatch negativity (vMMN), exhaustive exercise, fatigue