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【Results of Project II】

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Exercise training modulates M1/M2 macrophage phenotype in adipose tissues of obese mice

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Purpose: Recent investigations suggest that exchange of macrophage phenotype (M1/M2) in adipose tissues is associated with chronic low-grade inflammation in obesity. Although exercise training inhibits inflammatory cytokine gene expressions in adipose tissues, it remains unclear whether exercise training affects a phenotypic switch in adipose tissue macrophage polarization. Therefore, we newly investigated the effect of exercise training on a macrophage phenotypic switch in adipose tissues. **Methods:** Male C57BL/6 mice were divided into four groups; normal diet (ND) control, ND exercise, high-fat diet (HFD) control, and HFD exercise. Mice ran on a treadmill at 12-20 m/min for 60 min/day, for 16 weeks. Adipose tissues were obtained from

epididymal fat pads. **Results:** Although mRNA expressions of CD11c and TLR4, which are M1 macrophage specific markers, significantly increased in adipose tissues in the HFD control group, the expressions decreased significantly in the HFD exercise group compared with the HFD control group. Although CD163, a M2 macrophage specific marker, mRNA expression significantly decreased in adipose tissues in the HFD control group, the expression increased significantly in the HFD exercise group compared with the HFD control group. **Conclusion:** Exercise training induced a phenotypic switch from M1 macrophage to M2 macrophage in adipose tissues of obese mice.

Effects of rowing training on abdominal muscle and fat in elderly men

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The purpose of this study was to examine the effects of rowing training on abdominal muscle and fat size in elderly men. In cross-sectional study, we compared the cross-sectional areas (CSAs) of abdominal muscle and fat measured by MRI in 16 elderly male rowers (ROW: age, 67.8±2.3 yr) and in 18 untrained men

(CON: 66.2±3.0 yr). ROW had a 20% larger total abdominal muscle CSA than CON ($P<0.01$); rectus abdominis, psoas major and erector spinae were 27%, 64% and 14% larger in ROW than in CON ($P<0.05-0.001$), respectively. On the other hand, there were no differences in visceral and subcutaneous fat

CSAs between the two groups. In intervention study, nine sedentary elderly men (71.8 ± 4.4 yr) trained on rowing ergometer for 24 weeks at three times/wk. In response to 24 week-rowing training, total abdominal muscle, rectus abdominis, psoas major and quadratus lumborum CSAs increased by 6%, 11%, 23% and 10%,

respectively ($P < 0.05 - 0.001$). Subcutaneous fat CSA decreased by 17% ($P < 0.01$), but no change was observed for visceral fat CSA. These findings suggested that rowing training is a valuable tool for increasing abdominal muscle size, especially rectus abdominis and psoas major, for elderly men.

Exploring effective strategies for promoting strength training behavior in community-dwelling older people

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The purpose of the present study was to examine the associations among awareness of the role of strength training in care prevention, negative perception of strength training, and stages of change for strength training behavior among Japanese older adults. A cross-sectional questionnaire survey was conducted to 1124 older adults (60-74 years) randomly sampled from the Tokorozawa city. Regarding the research items, the dependent variable was stages of change for strength training behavior, and the independent variables were awareness of the role of strength training in care prevention and negative perception of strength training. Analysis of covariance was utilized. After adjusting for demographic variables (age, self-reported health status, body pain, and smoking habits), higher awareness

($p < .0001$) and lower negative perception ($p < .0001$) were significantly associated with higher stages of change. In post-hoc analysis, significant differences of the awareness were revealed among precontemplation, contemplation, and other 3 stages. In the perception, significant differences were revealed between precontemplation and other 4 stages, and between contemplation and maintenance. Although the data is insufficient to determine causal relationships, these results indicate that promoting the awareness of the role of strength training in care prevention and modifying negative perception might effective strategies to encourage strength training among older adult, especially for those in earlier stages.