Cardiorespiratory Fitness is Closely Associated with Brain-derived Neurotrophic Factor and Nerve Growth Factor in Middle Aged Women

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It has been well known that increased cardiorespiratory fitness (CRF) caused by regular physical activity may positively affect brain health. However, several previous studies have reported that there is an inverse association between cardiorespiratory fitness and brain-derived neurotrophic factor (BDNF) as a brain health marker in males. Therefore, the purpose of this study is to examine an association among CRF, BDNF, and nerve growth factor (NGF) in middle aged women. Participants of this study were middle aged women (n=103; age, 43±8 years; height, 158.3±5.2 cm; weight, 59.8±9.4 kg; BMI, 23.9±3.5 kg/cm²). Graded exercise test using treadmill was used for measuring...
CRF. Basal serum BDNF and NGF as brain health markers were analyzed. Based upon CRF quartiles, basal serum BDNF and NGF were significantly increased and there was a positive association among CRF, BDNF, and NGF ($p<0.05$). As CRF was increased by 1mL/kg/min, basal serum BDNF and NGF were increased by 9.96 pg/mL and 3.38 ng/mL, respectively. In conclusion, this study result implied that enhanced CRF caused by regular physical activity might positively improve brain health in middle aged women.

**Key Words:** middle aged women, cardiorespiratory fitness, regular physical activity, brain health

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**Introduction**

Middle aged women entering turning point in life cycle have been reported to have increased incidence of various chronic diseases and over 25% of middle aged women have mood disorder caused by menopause with changes in body function, social position, and family (Park et al., 2005). It has been reported that over 50% middle aged women having mood disorder also have depressive symptom, which shows a higher association with Alzheimer’s disease incidence (Andersen, Lolk, Kragh-Sorensen, Petersen, & Green, 2005; Hoogendijk et al., 1999; Sui & Zhang, 2010; Wint, 2011). Based upon previous studies, increased cardiorespiratory fitness by regular physical activity has been reported to decrease cardiovascular disease risk factors as well as increase positive effects on depressive symptom, which implies that physical fitness would be an important factor for improving brain health (Erickson et al., 2007; Hillman, Kamijo, & Scudder, 2011; Ramsbottom, Currie, & Gilder, 2010; Shin, Kang, Park, & Heitkemper, 2009). However, most previous studies have been conducted with animal and young human subjects. Therefore, it would be necessary to study brain health and physical fitness in middle aged women.

Most previous studies used psychological test using brain wave and