

STEPWISE RELATIONSHIP OF EXERCISE FREQUENCY WITH SERUM BDNF LEVEL AMONG ADOLESCENTS

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INTRODUCTION

- Physical activity (PA) in adolescents is associated with numerous health benefits, including improved functions of the CV, metabolic, muscular, respiratory, immune, and neurohormonal systems (Dobbins, 12; Strong 06).
- The American College of Sports Sciences recommend 3-5 times/week of moderated/vigorous exercise to improve health and fitness (ACSM, 11).
- Brain derived neurotrophic factor (BDNF) is essential for neural growth and functions, especially the ones related to cognitive adolescents (Verburgh, 14; Jeon, 15).
- Exercise seems to enhance cognitive function (Verburgh, 14), and serum BDNF levels (Jeon, 15) in adolescents.

GAPS AND PURPOSE

- However, the relationship of PA frequency with serum BDNF level is still scarce in adolescents.
- Examine the relationship of the frequency of participation in running exercise with serum BDNF level among adolescents.

METHODOLOGY

Design and Participants

- Adolescents from 7th-12th grades were recruited to participate in the study.
- Informed consents and assents were obtained from all adolescents after detailed orientation.
- A self-reporting questionnaire was used to assess weekly frequency of participating in running PA.

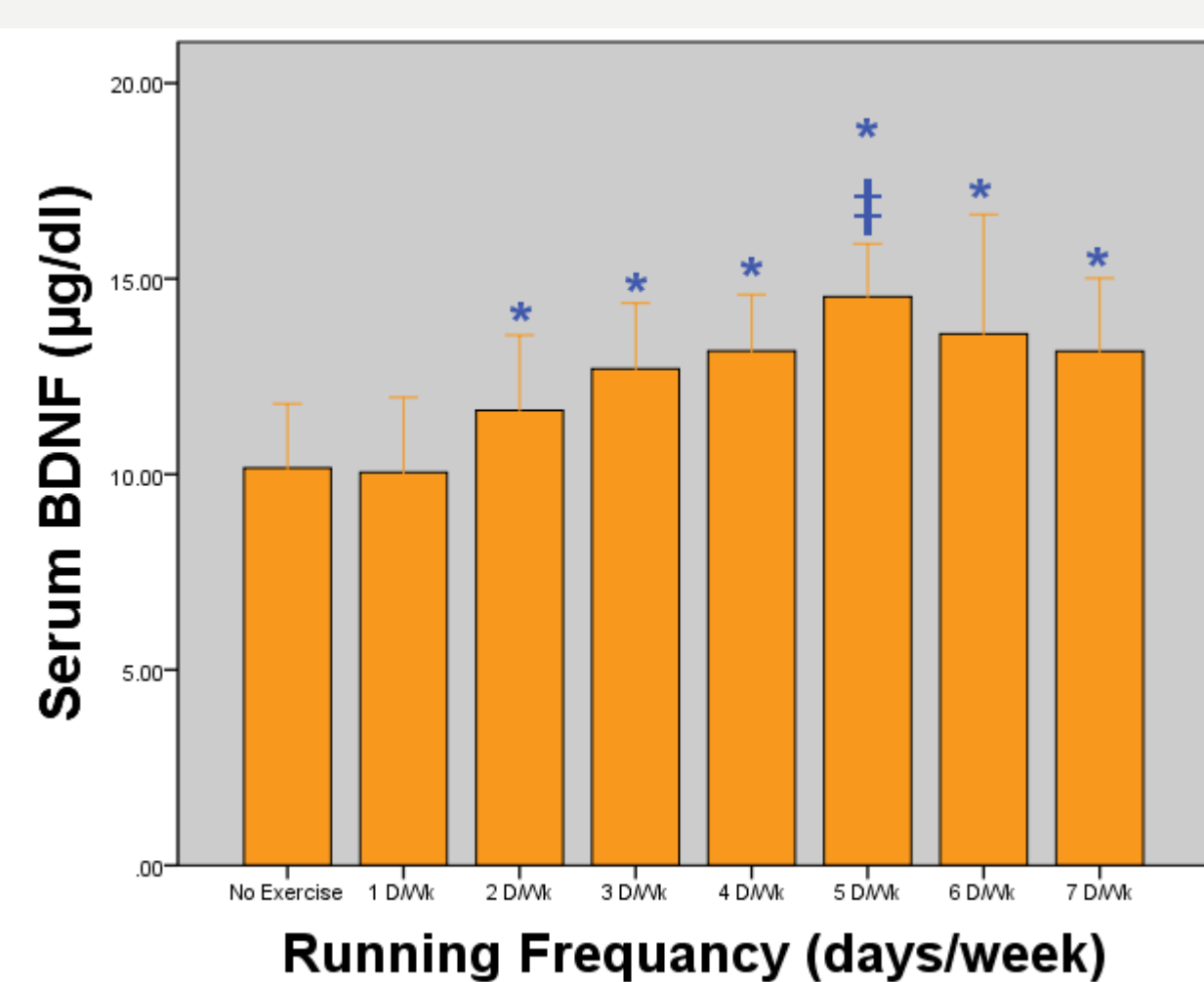
BDNF and Physical Activity Measurements

- Blood samples were drawn using venipuncture from antecubital veins into plain glass tubes while participants were sitting.
- After collection, samples were spun for 8-10 minutes at 1500 xg to obtain serum for BDNF measures.
- Serum samples were then divided into several aliquots and immediately stored at -80°C for future use.
- Serum BDNF was determined by ELISA.
- Weekly frequency of running was self-reporting using the "SALSA" questionnaire to determine moderate/vigorous exercise.

RESULTS

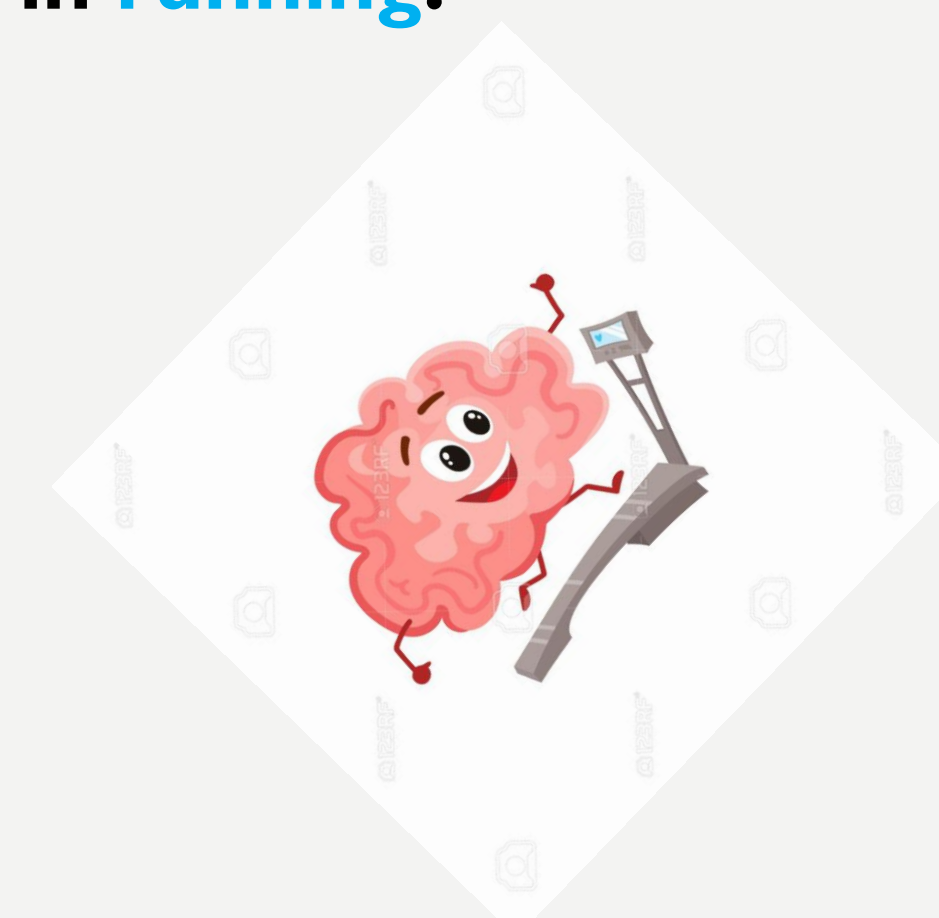
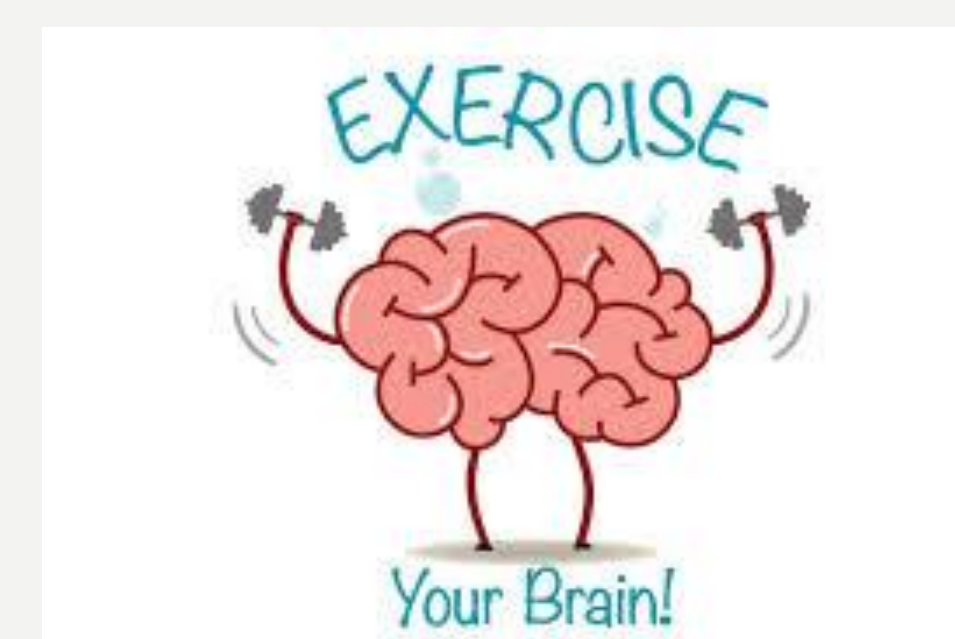
Adolescent characteristics (n=703)

Variables	Mean±StD
Gender (M:F)	48.5:51.8
Age (years)	14.6±1.1
Height (cm)	160.5±10.3
Weight (kg)	56.2±13.7
Fat (%)	19.0±8.3
BMI (kg/m ²)	21.9±5.3



*=p<0.05 vs. no exercise & 1 day; ‡=p<0.05 vs. 2 days

The ANOVA revealed differences in BDNF levels according to frequency of participation in vigorous PA. Subsequent post-hoc comparison showed that BDNF levels increased in a stepwise manner and peaked at 5 day participation in running.



CONCLUSIONS

- The study confirms the importance of PA for BDNF.
- Regular participation in exercise seems to increase BDNF mRNA transcription, formation, and release in several brain compartments (Vaynman, 04).
- This increase is associated with promoting growth and survival of neurons, synaptic plasticity, efficacy and modulation (Seifert, 10). Consequently, cognitive function, particularly learning and memory, are improved (Joundi, 12).
- In the current study, serum BDNF level increased in a stepwise fashion as frequency of exercise increased.
- This is consistent with the "dose-response" principle of exercise training that indicates improvements are greater with more stimulus (i.e. exercise).
- The results suggest that some exercise (3-4 d/wk) is beneficial for BDNF, however more can be even better.
- Adolescents should regularly participate in exercise according to the international exercise recommendations (ACSM, 09).



RECOMMENDATIONS

- Interventional and longitudinal studies are needed to examine the long-term effects of various frequencies of exercise on serum BDNF.
- Additionally, studies are needed to investigate the dose-effect of exercise-induced increase in BDNF with cognitive function among adolescents.

