Acute After-School Screen Time in Children Decreases Impulse Control: A Randomized Crossover Trial

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(Purpose reported)

Purpose: This study examined the effect of three hours of after school active play vs. sedentary screen time on executive function in children.

Methods: This study used a crossover design with treatment conditions that were randomized and counter-balanced. There were two experimental conditions: three hours of active play compared to three hours of sedentary screen time. Participants included 32 boys and girls age 8-9 yrs. Physical activity patterns were measured using an actigraph accelerometer. Executive control was measured using the Stroop color and word test.

Results: The mean age and BMI were 8.7 ± 0.4 years and 16.9 ± 2.2. On the active day, children spent 95 ± 28 minutes in MVPA after school compared to 3 ± 3 minutes on the sedentary day (F = 252.1, P < 0.0001). There was no difference between days in the Stroop Task performance for word reading or color naming. However, there was a significant difference between conditions for the incongruent task, with children performing better on the active day (F = 6.79, P = 0.015).

Conclusions: The results of this study demonstrate that active play after school improves executive function in children by increasing their ability to inhibit cognitive interference.

Acute Exercise Alters Functional Connectivity During Cognitive Task

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(Purpose reported)

Purpose: There is a growing body of evidence to show that acute aerobic exercise improves cognitive performance. Nevertheless, it remains largely unknown how acute exercise improves cognitive performance. The purpose of this study was to test if alteration in functional connectivity is involved in improving cognitive performance induced by acute exercise.

Methods: Participants were 10 healthy right-handed young men (age: 21 ± 1.4 yr., peak oxygen uptake = 46.5 ± 8.7 ml/kg/min). Experiments were conducted in a randomized crossover design. In the Exercise condition, subjects cycled at 40% peak oxygen uptake for 30 minutes. In the Control condition, subjects rested for 30 minutes without exercise. In both conditions, participants performed cognitive task (Go/No-Go task) before and after exercise (rest). We first analyzed regions specifically activated by exercise as region of interest. Then, we identified regions where functional connectivity was altered before and after exercise. We also identified regions where amount of alteration in functional connectivity was correlated with that of reaction time (RT).

Results: RT was reduced in the Exercise condition (Pre: 420 ± 77 ms, Post: 388 ± 65 ms, p = 0.02), while it did not change in the Control condition (Pre: 416 ± 79 ms, Post: 417 ± 78 ms, p = 0.82). We observed significant increases in activation in the opercular and triangular parts of the left inferior frontal gyrus (IFG) and anterior cingulate cortex (p < 0.01, uncorrected). We observed an increase in functional connectivity between the opercular part of the left IFG and the left putamen (Pre: 0.02 ± 0.11, Post: 0.12 ± 0.13, p = 0.08). Alteration in the functional connectivity between these regions was negatively correlated with the alteration in RT (r = -0.44, p = 0.06).

Conclusions: Alteration in functional connectivity may be associated with improvement of cognitive performance after acute exercise.

The Effects Of Exercise Intensity On Auditory Processing Speed And Flexibility: A Randomized Crossover Study.

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(Purpose reported)

Purpose: The purpose of this study was to determine how exercise, at a moderate and vigorous intensity, alters auditory processing speed and flexibility, and calculation ability.

Methods: One hundred and thirty-six men and women between the ages of 18-45 were recruited for this randomized crossover study. Participants were randomly assigned to each of the following exercise conditions: moderate (35% VO2 max), vigorous (70% VO2 max), and sedentary (no exercise). Each condition lasted 40 minutes and was separated by 7 days. After the exercise condition, a battery of cognitive tests were administered. The Paced Auditory Serial Addition Test (PASAT) was one of these tests and was used to measure the relationship between exercise intensity and auditory processing speed and flexibility.

Results: Eighty-one men (age=23.2, BMI=23.9 ± 3.2) and fifty-five women (age=20.9, BMI=22.4 ± 2.8) completed the study. There was no main effect of condition for the number of problems answered correctly (F = 1.24, P=0.2900), the number of problems attempted (F = 1.48, P=0.2291) and the percent of problems correctly answered (F = 1.69, P = 0.1865). There was a main effect for gender for the number of problems answered correctly (F = 21.7, P < 0.0001), the number of problems attempted (F = 19.5, P < 0.0001) and the percent of problems answered correctly (F = 7.06, P = 0.0084). However, there was no significant gender by condition interaction for any variable of interest (Ps > 0.05).

Conclusions: The results of this study show that there is no significant relationship between exercise and auditory processing speed and flexibility, and calculation ability post exercise. These results suggest that exercise at a moderate or vigorous intensity does no hinder a person’s ability to perform complex cognitive processing tasks.

The Effects Of Acute Aerobic Exercise On BDNF Levels And Cognition In Postmenopausal Women

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(Purpose reported)

Purpose: The purpose of this study was to examine how menopausal status affects choice reaction time and peripheral BDNF levels after aerobic exercise. It was hypothesized that exercise would affect peripheral BDNF levels and choice reaction time similarly among pre and postmenopausal women.

Methods: The subjects consisted of 14 active females (7 premenopausal and 7 postmenopausal). Subjects went through two different trials: an exercise trial and a controlled reading trials. The exercise trial consisted of running on a treadmill at 75% of VO2max for 30 minutes. The control trial consisted of a reading session. A computerized Stroop test was given to assess choice reaction time, and blood samples were obtained before, immediately after, and 30 minutes after the exercise and control trials.

Results: Exercise did not lead to a significant change in BDNF in either group. However, there was a statistical interaction (P=0.041) between pre and postmenopausal women over time between pre and post timepoints, with premenopausal women trending towards an increase in BDNF, and postmenopausal women trending towards a decrease in BDNF. There was a large effect size within this interaction represented with a partial eta squared value of .265. A Post Hoc test was done to further investigate the interaction. There was not enough statistical power (P = .164) to state that there was a difference in BDNF levels (pre to post) but that there appears to be a trend. Both age and FSH had indirect relationships with BDNF (p=0.05); the greater the age or FSH, the lower the peripheral BDNF levels. There was a positive correlation between age and Stroop Test time over all time points (P = 0.393, 0.089, and 0.027; pre, post, and post30 exercise respectively). This indicated an age-related decline in choice reaction time capabilities.