The United States’ childhood population is becoming increasingly sedentary.¹ This statistic is thought to be a direct cause to the current academic decline in standardized test scores among children. Currently, US children rank 25th in math and 17th in science out of 33 surveyed countries around the globe. There is an important link between exercise and cognitive function that is often overlooked by entities such as the World Health Organization when publishing childhood exercise guidelines. This link may be the key, not only for general physical and mental wellbeing, but also for increasing academic performance among children.

In other brain regions that are linked to exercise:
- Hippocampus
- Perirhinal cortex
- Temporal lobe

These areas are responsible for emotions, memory and item retrieval from memory.²,³,⁷

Acknowledgements: Dr. Lori Hardy, PhD; Dr. Francis Jenney, PhD; Valeria Maxwell-Nollia
Contact: danielmaxw@comau

Literature Cited
8. In other words, a child’s fitness level is directly proportional to academic success. Regional FMRI. 2013. In other words childhood may be applicable to adults and vice versa.

Video games dubbed “Exergames.” Video games that incorporate interpersonal interactions, movement, or exercise. Requires Coordinative activity: physical activity thinking, planning, and interpersonal interactions.²

Treatment for congenital diseases such as Fragile X, Down syndrome, Autism spectrum disorders.
- Sowa M,²⁷ - Motor function and social difficulties improve with exercise. (5, 3AD)
- Sowa M. High intensity vs. low intensity sympathetic changes with FMS. Treatment for Alzheimer’s and other neurodegenerative disease.
- Peuschel A, et al.²⁷ - Treadmill walking accelerates walking milestone in 30 infants (typically 1 year later)
- Llorens-Martin M.²⁷ - Exercise induced neurogenesis of new hippocampal cells OS model mice

<table>
<thead>
<tr>
<th>Exercise intensity</th>
<th>Mild</th>
<th>Moderate</th>
<th>Vigorous</th>
<th>Above Vigorous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Rate (%)</td>
<td>55%</td>
<td>60-74%</td>
<td>75-91%</td>
<td>&gt;95%</td>
</tr>
</tbody>
</table>

Exercise enhances cognitive function in children
Daniel W. Maxwell OMS-II
Philadelphia College of Osteopathic Medicine – Georgia Campus

Mild
Moderate
Vigorous
Above Vigorous

Conclusions:
- Chronic Exercise is better than acute, but acute is still beneficial.
- Greater fitness = less fatigue, in both exercise and cognitive performance.
- 30-60 minutes of exercise, with at least 15 minutes of moderate or moderate-to-vigorous intensity.

Mild activity repeated or engaged
Moderate activity repeated or engaged
Vigorous activity repeated or engaged

Faster, better, stronger!

The Future

The Research

The Link: Cognitive processes are required for meaningful direct engagement through tasks such as motor planning and decision-making. Therefore, the prefrontal cortex must also draw resources and blood supply when motor tasks are performed. It is hypothesized that through this metabolic connection and practice of the cognitive functions required to perform physical activities, the prefrontal cortex benefits from exercise.²

Other brain regions that are linked to exercise:
- Prefrontal Cortex
- Executive Function
- hypofrontality, Hypothysis

Prefrontal Cortex

Executive Function
- Selection
- Planning
- Initiating appropriate actions
- Inhibiting inappropriate actions

Cognition
- Learning information
- Judgement
- Organization
- Interactions

Defining Exercise

Acute Exercise
- Any physical activity performed only once for any duration or intensity.
- Acute exercise activity that was carried out more than once, for any period of time less than one month and for any duration or intensity.
- Chronic exercise activity repeated or engaged in at least three times per week, with no maximum days per week of participation, for more than one month.

FMRl studies have shown that similar areas of the brain active during physical and cognitive demands.³,⁴ Resources required by these areas in constant competition. If only cognitive tasks are being utilized, the portions of the brain responsible for those functions will consume more resources and deprive the rest of brain of excess resources. The same is true for any task which utilizes the brain.