Results

There is a growing body of research supporting a positive relationship between physical activity (PA), cognitive functions and academic achievement. Cognitive demands, particularly executive functions, are acknowledged as a predictor for academic achievement. Recently, intervention studies are revealing that not all forms of PA benefit cognition equally. To date, the cognitive engagement inherent in many forms of PA is one of the qualitative aspects most widely discussed. This cognitive demand is thought to induce cognitive engagement, which is defined as the degree to which cognitive effort is needed to master difficult skills. Previous studies, compared experimental conditions to an in-active control condition, e.g. sedentary academic or regular lessons. Therefore, it is not surprising that children’s cognitive functions benefit from all varieties of PA interventions when they were compared to either no treatment or purely academic content. Interventions comparing cognitively challenging vs. cognitively non-challenging PA, found the enhancement to be significantly more pronounced in response to cognitively engaging activities. The “cognitive stimulation hypothesis” provides a possible explanation for the cognitive improvement. The assumption is that cognitively demanding exercises activate similar brain regions that are used to control higher-order cognitive processes.

The aim of this study was to compare systematically different PA modalities with different amounts of physical exertion and cognitive engagement in a long-term PA intervention.

Participants

N = 142 (64.9% female), 2nd grade children: M = 7.91 years (SD = 0.40). Conditions:

• Combo group: specifically designed physical activity breaks integrating cardiovascular-stimulating tasks with executive demands; n = 47.
• Aerobic group: specifically designed physical activity breaks integrating cardiovascular-stimulating tasks; n = 49.
• Cognition group: specifically designed physical activity breaks integrating executive demands; n = 46.

Table 1: Means and standard deviations of the background variables for the three groups.

<table>
<thead>
<tr>
<th>Sample Characteristics</th>
<th>Combo</th>
<th>Aerobic</th>
<th>Cognition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>7.94</td>
<td>7.96</td>
<td>7.82</td>
</tr>
<tr>
<td>Gender (m/f)</td>
<td>21/26</td>
<td>21/26</td>
<td>22/24</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>16.21</td>
<td>16.51</td>
<td>16.21</td>
</tr>
<tr>
<td>Motor skills</td>
<td>103.28</td>
<td>106.25</td>
<td>105.81</td>
</tr>
<tr>
<td>Aerobic fitness</td>
<td>273.79</td>
<td>146.74</td>
<td>313.09</td>
</tr>
</tbody>
</table>

Discussion

The current results are in line with previous research showing a higher improvement on cognitive performance for those interventions with higher amounts of cognitively engaging PA.

Besides physical education, classroom-based PA breaks are a further opportunity, not only to enhance daily PA time, but also to improve children’s cognitive outcomes. High-qualitative PA breaks, such as a combination of both PA and cognitive engagement, seems to be the most effective if the adjustment of quantitative characteristics (duration and intensity) is considered as well.

References