Bringing the Brain to the Head of the Class

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THE WORLD HAS STOPPED MOVING

Total Decline in Physical Activity

-32% in 44 years

-46% in 65 years

Decline in Physical Activity by Activity Area

1965 Baseline

2009

2030 Projection

Active Leisure

Transportation

Domestic

Occupational

Key:

Designed to Move: A Physical Activity Action Agenda
Benefits of Physical Activity and Physical Education

- Physical Health
- Mental Health
- Psychosocial Health
- Brain Health

Academic Performance
Recommendation from the IOM: Whole-of-School Approach

FIGURE 1-2 Integrated/coordinated approach to increasing physical activity among children and adolescents in the school environment before, during, and after school. NOTE: PA = physical activity; PE = physical education.
Comprehensive School Physical Activity Program

- Physical Education
- Physical Activity During School
- Physical Activity Before and After School
- Staff Involvement
- Family & Community Engagement

60 minutes a day
Poll Question

- Do you know of a school district or a school that is currently implementing a Comprehensive School Physical Activity Program?
  - Yes
  - No
CSPAP and Professional Development

- Physical education teachers (n = 330) from 9 different states
- Comparison of control, non-implementers, partial, & full implementers of CSPAP
- The more professional development hours, the more likely the teachers were to be full implementers of CSPAP

Centeio, Barcelona, Beighle, Carson, & Castelli (submitted for review)

Funded by *Active Living Research* (Round 10)
Quality Physical Education (QPE)

Key Components
- Opportunities to learn
- Meaningful content
- Appropriate instruction
- Assessment to track learning

Quality
- Elementary 150 mins/wk
- Secondary 225 mins/wk
- Safe participation for all
- Developmentally appropriate
- Interesting & motivating
- Highly qualified teacher
- Varied approaches
- Assessment informs instruction
Quality Physical Education (QPE)

- **Team Sports at school**: 53.2% (53.2%) - 16.4% (16.4%)
- **Outdoor activities**: 50.5% (50.5%) - 15.2% (15.2%)
- **Cycling**: 46.3% (46.3%) - 15.2% (15.2%)
- **Running/jogging**: 36.8% (36.8%) - 11.9% (11.9%)
- **Water sports**: 27.1% (27.1%) - 6.5% (6.5%)
- **Swimming fitness/competition**: 26.2% (26.2%) - 10.4% (10.4%)
- **Winter sports**: 23.0% (23.0%) - 6.0% (6.0%)
- **Racquet sports**: 16.3% (16.3%) - 3.8% (3.8%)
- **Fitness/health club activities**: 11.5% (11.5%) - 4.1% (4.1%)
- **Golf**: 11.1% (11.1%) - 3.1% (3.1%)

Source – Physical Activity Council, 2010 (41,000 interviews)
Physical Education, Physical Activity & Academic Performance

If we get K-12 students to meet the national physical education standards,

Then Now we can claim that participation in physical education and physical activity opportunities facilitate learning and enhance brain health.
The Number of Studies About Physical Activity and Cognition By Decade (Children)

Castelli et al., in press
Cognitive & Brain Health

- Measurement of cognition varies by age:
  - Standardized tests, grades, attendance, memory
  - Observation: Attention, EEG, fMRI, Stroop
  - Self-report: Ability to carry out daily living tasks
  - Survey/interview: Having a sense of purpose

- Executive control (measured in the lab)
  - A subset of cognitive processes related to sequencing, discrimination, and inhibition
  - Inhibition, working memory, and cognitive flexibility
Brain Event Related Potentials

Stimulus  Response

X  →  X  →  X  →  X

![Brain Event Related Potentials Image](image_url)
Measurement of Executive Control

- Stimulus-response (i.e., Odd ball paradigm)
  - Press the button when you see the cat

- Discrimination tasks (i.e., Flanker’s task)

- Congruent/non-congruent (i.e., Stroop, Go/NoGo)

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Acute Exercise in Preadolescent Children

## Effects of a Single Session of PA

<table>
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<th>Time</th>
<th>Less than 5-mins</th>
<th>5-10 mins</th>
<th>20-mins</th>
<th>30-mins</th>
<th>60-mins</th>
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<tbody>
<tr>
<td><strong>Benefits</strong></td>
<td></td>
<td></td>
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<tr>
<td>Attentional Reset</td>
<td>Stand up &amp; Shake Activity</td>
<td>Numbers Activity</td>
<td>Inhibitory control</td>
<td>Task flexibility</td>
<td>Memory</td>
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<td>Attention On/off task behavior</td>
<td>Inhibitory control</td>
<td>Novel tasks</td>
<td>Task flexibility</td>
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<td>Memory</td>
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| Possible Activity | Stand up & Shake Activity | Numbers Activity | Recess | Physical Education |

*Be active every 60 minutes!*
Texas Fitness Study

Observations = 38,992; Districts = 1,263; Schools = 6,365
(83% of Texas students grades 3-12)

Figure 1. Spearman correlations between cardiovascular fitness achievement and Texas Assessment of Knowledge and Skills achievement by age and grade level.

Figure 2. Spearman correlations between body mass index fitness achievement and Texas Assessment of Knowledge and Skills achievement by age and grade level.

(Welk, Jackson, Morrow, Haskell, Meredith, & Cooper, 2010)
## Physical Fitness & Unexcused Absences

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<th>Unstandardized</th>
<th>Standardized</th>
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<tr>
<td>PACER time</td>
<td>-.029</td>
<td>-.092</td>
<td>.034</td>
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<td>One-mile run time</td>
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<tr>
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<td>.143</td>
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<tr>
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<td>Free/Reduced Lunch</td>
<td>.372</td>
<td>.024</td>
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<td>Attitudes towards PA</td>
<td>-.015</td>
<td>-.028</td>
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Cance, Castelli, Centeio, & Barcelona, under review
FITKids: Inhibition Task

Pre-test 9 Months Later

FITKids Intervention

Waitlist Control

Kamijo et al., 2012
Improving **Educational** Outcomes

Improves **Health** Outcomes
Recommendations

1. Demand quality PE/PA programs
2. Implement CSPAP in your school
   - No more than 60-mins of sedentary time
   - At least 10-mins of physical activity after sedentary time
3. Help others understand why school PE and PA are important
   - Quality of life
   - Health issues
   - Academic success
4. Advocate for policies supporting PE/PA programs and activity breaks