Can Physical Activity Breaks Reduce Attentional Failures and Improve Children’s Learning Outcomes?

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Overview

- Importance of studying physical activity breaks
- Study design & methodology
- Findings
- Future directions
Background: Attention

- Only 50 to 75% of classroom time spent on task
  - Karweit & Slavin (1981)

- Elongated developmental trajectory of attention
  - Ruff & Lawson (1990)
  - See Ruff & Rothbart (2001) for review

- *Time-on-Task* hypothesis
  - Learning is related to the amount of time children spend engaged in learning activities
  - Carroll 1963; Godwin et al., 2016
Background: Physical Activity Breaks

- Physical activity breaks
  - Brief bouts of physical activity between instructional activities

- Hypothesized to improve attention, reduce off-task behavior, and promote academic success
  - Best (2012); Howie et al. (2014); Mahar et al. (2006); Janssen et al. (2014)

  - Empirical evidence regarding effectiveness is lacking
    - Resaland et al. (2016); Wilson et al. (2015)

  - Operational definitions vary
    - Schmidt et al. (2016)

  - Optimal duration and intensity level for physical activity breaks are unknown
    - Howie et al. (2014); Jager et al. (2015)
Research Questions

1. Do brief physical activity breaks improve attention on a subsequent task?

2. Do brief physical activity breaks improve learning on a subsequent task?
Method: Within-Subject Design

N = 42 elementary-school children ($M_{age} = 9.06$, $SD = .77$)
Physical Activity Break

STAR JUMPS
25 seconds
Physical Activity Break

STAR JUMPS
25 seconds

Control Break

GLACIERS
<table>
<thead>
<tr>
<th>Pretest</th>
<th>Learning Phase</th>
<th>Posttest</th>
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**Paired Associates Task**
Paired Associates Task

Pretest | Learning Phase | Posttest

[Images of monkeys]
Paired Associates Task

Pretest

Learning Phase

Posttest

“Mona”
Paired Associates Task

Pretest

“Tonkin”

Learning Phase

“Vervet”

Posttest
Paired Associates Task

Pretest

Learning Phase

Posttest

“Tonkin”
Paired Associates Task

Pretest

Learning Phase

Posttest
Measures

Attention

- Video coding by trained research assistants
  - Kappa = .89 - .98
- Proportion of on-task behavior
  
  \[
  \frac{\text{Number of on-task observations}}{\text{Total observations}}
  \]

Learning

- Recognition
  - Pre- and posttest scores
- Recall
  - Posttest scores
Do physical activity breaks improve *attention* on a subsequent task?
Do physical activity breaks improve learning on a subsequent task?
Do physical activity breaks improve learning on a subsequent task?
Discussion & Future Directions

- **Results are mixed.**

- **Future directions**
  - Experimentally manipulate the environment to create more attentional demands
  - Include a physiological measure of exertion*
  - Compare different durations and intensity levels of physical activity breaks to determine the optimal characteristics for increased attention and learning*
  - Include a more precise measure of attention using eye tracking technology*

*Grant submission under review.
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If you are interested in collaborating, participating, or simply just learning more, contact

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PA Break Exercises

1. Running in place (moderate pace)
2. Bicep curls (15 each arm)
3. Hop on left foot (45 hops)
4. Hop on right foot (45 hops)
5. Toe touches (12)
6. Small arm circles (45)
7. Jumping jacks (20)
8. Big arm circles (20)
9. Star jumps (11)
10. Side stretch (13)
11. High knees (same pace as running in place)
12. Windmills (21)
13. Lunges (9 each leg)
Science Lesson

- Read aloud story on either the solar system or planes
- Presented via PowerPoint
- Used to gather a baseline measure of attention
Paired Associate Task

- **Pretest**
  - Recognition task to assess their prior knowledge

- **Learning Phase**
  - Pairs of visual and auditory stimuli presented to the child

- **Posttest**
  - Recognition
    - Auditory stimulus (i.e. animal name) presented
    - Child selects the corresponding visual stimuli from a group of four
  - Recall
    - Visual stimulus presented
    - Child asked to recall the auditory stimulus associated with the visual
Future Directions

• Experimentally manipulate the environment to create more attentional demands

• Compare different durations and intensity levels of PA breaks to determine the optimal characteristics for increased attention and learning*

• Include a physiological measure of exertion*

• Include a more precise measure of attention using eye tracking technology*

*Grant submission under review.