



Physical Activity Across the Curriculum: Its All About the Brain

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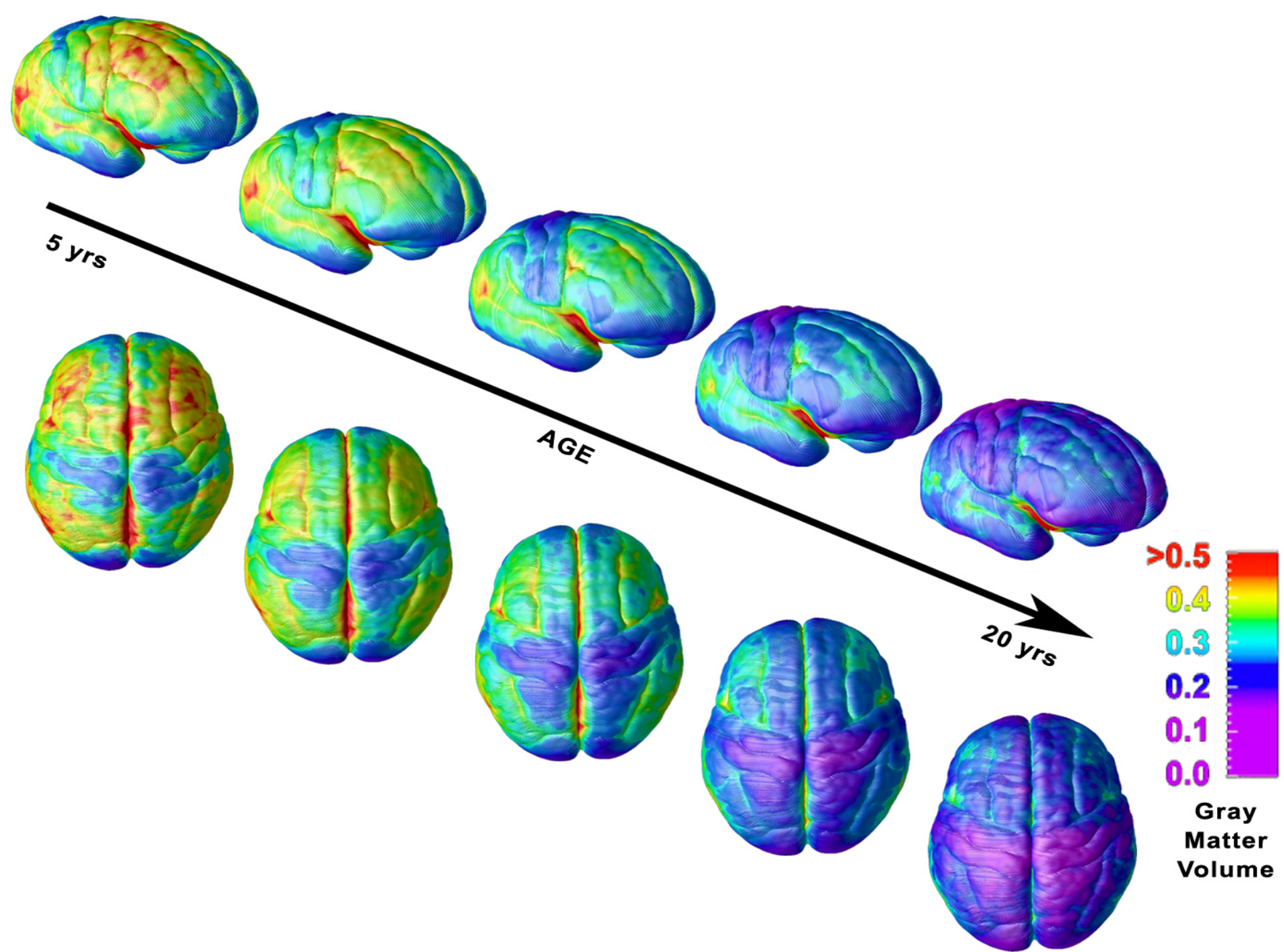
University of Texas at Austin

Overview

- Cognitive & brain health
- Current evidence: Acute and chronic
- What is the ideal *dose* of physical activity?
- Points of intervention and children's health
- What does this evidence mean for health promotion and leaders like you?

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



Texas Fitness Study

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

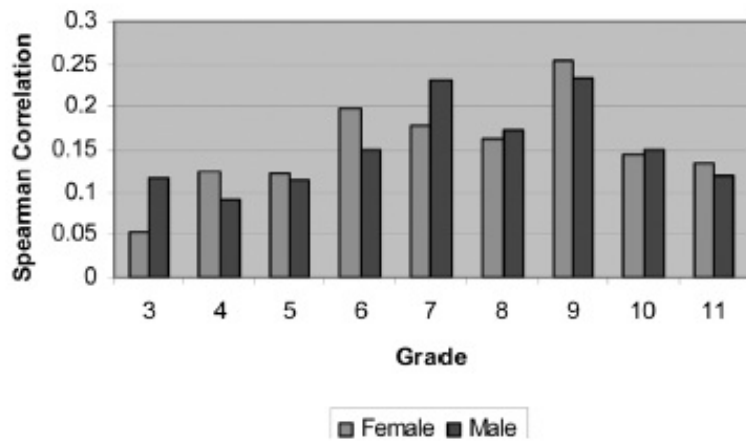


Figure 1. Spearman correlations between cardiovascular fitness achievement and Texas Assessment of Knowledge and Skills achievement by age and grade level.

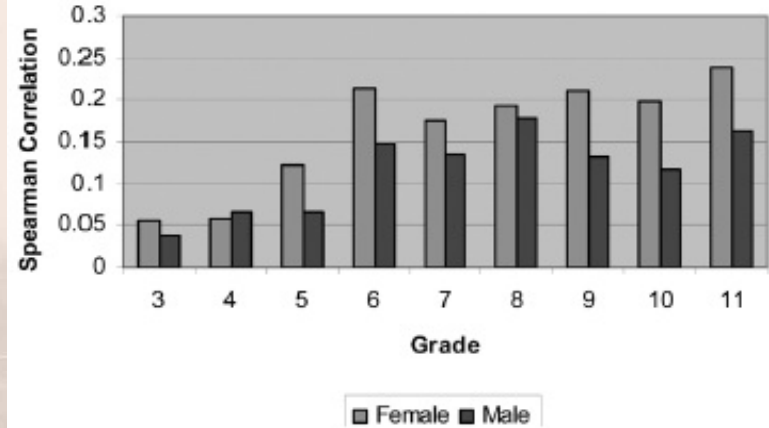
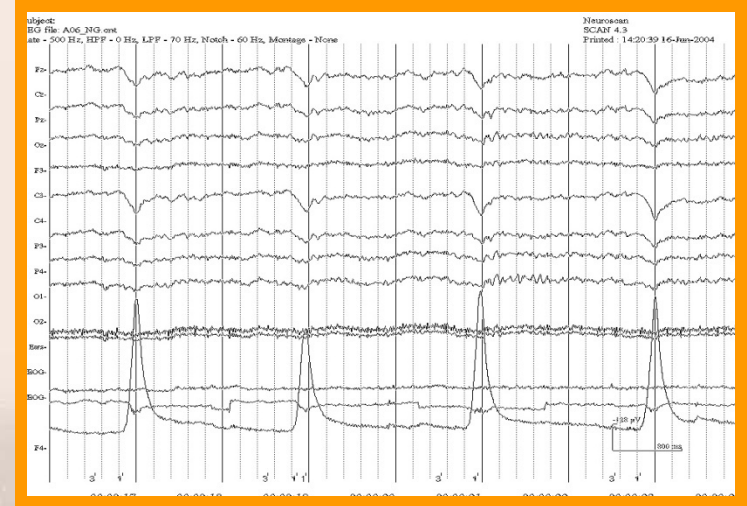


Figure 2. Spearman correlations between body mass index fitness achievement and Texas Assessment of Knowledge and Skills achievement by age and grade level.

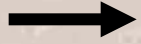
(Welk, Jackson, Morrow, Haskell, Meredith, & Cooper, 2010)

Brain Event Related Potentials



Stimulus

X



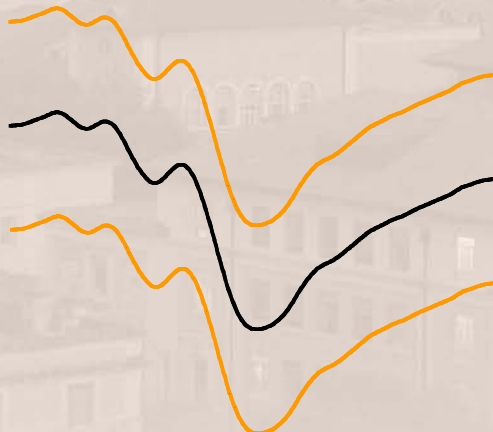
X



X



Response



Measurement of Executive Control

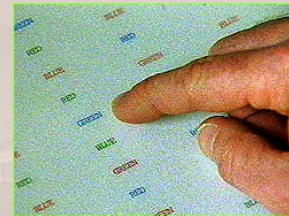
- Stimulus-response (i.e., Odd ball paradigm)
 - Press the button when you see the cat



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



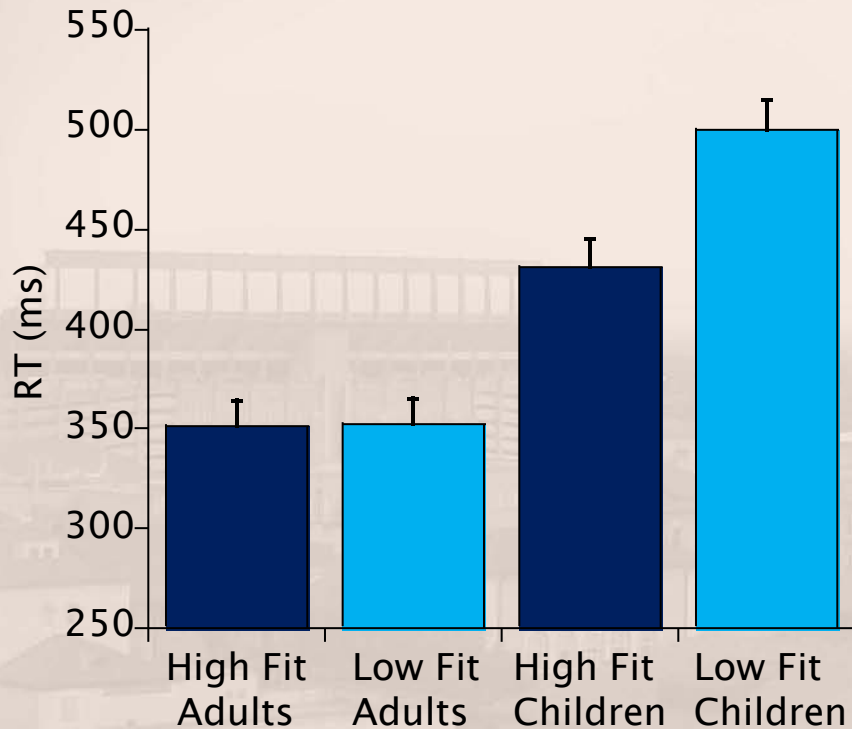
- Congruent/non-congruent (i.e., Stroop, Go/NoGo)



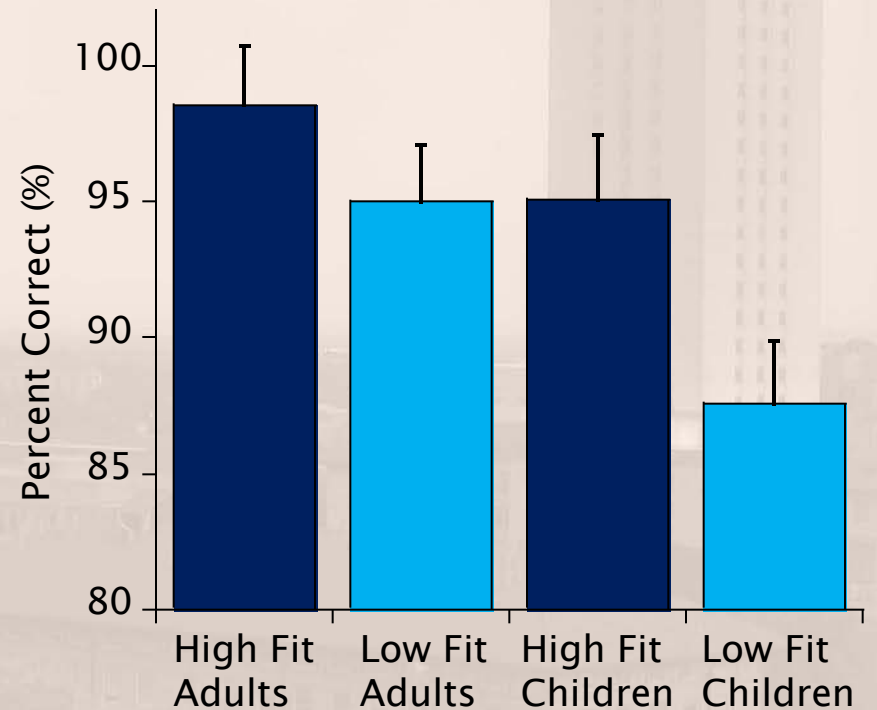
Green	Blue
Blue	Red
Red	Green

Cognitive Task Performance

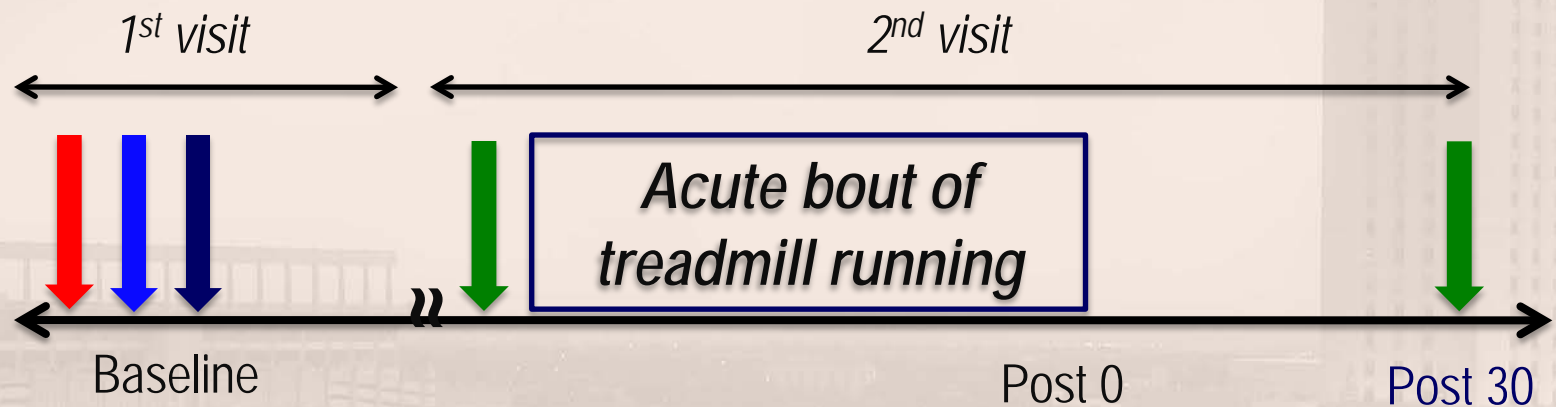
Reaction Time



Response Accuracy

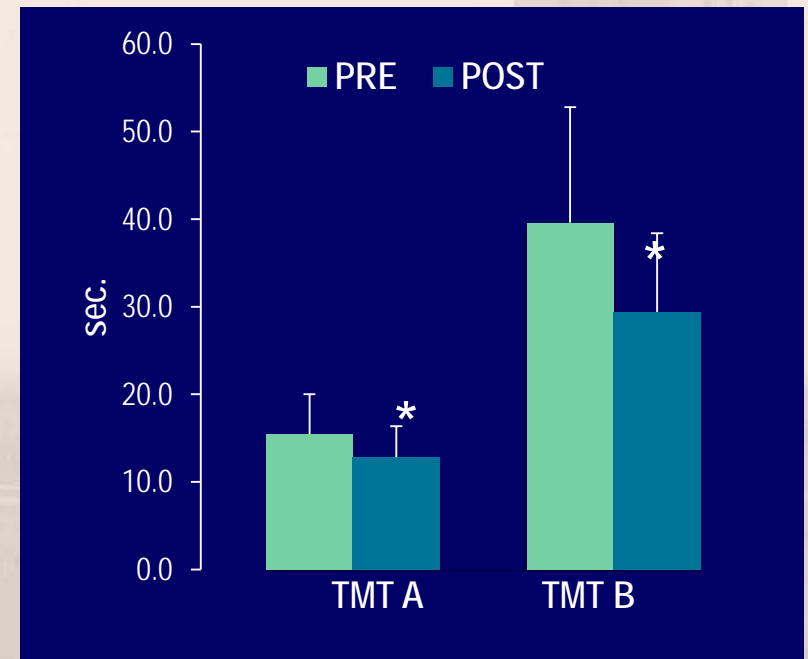
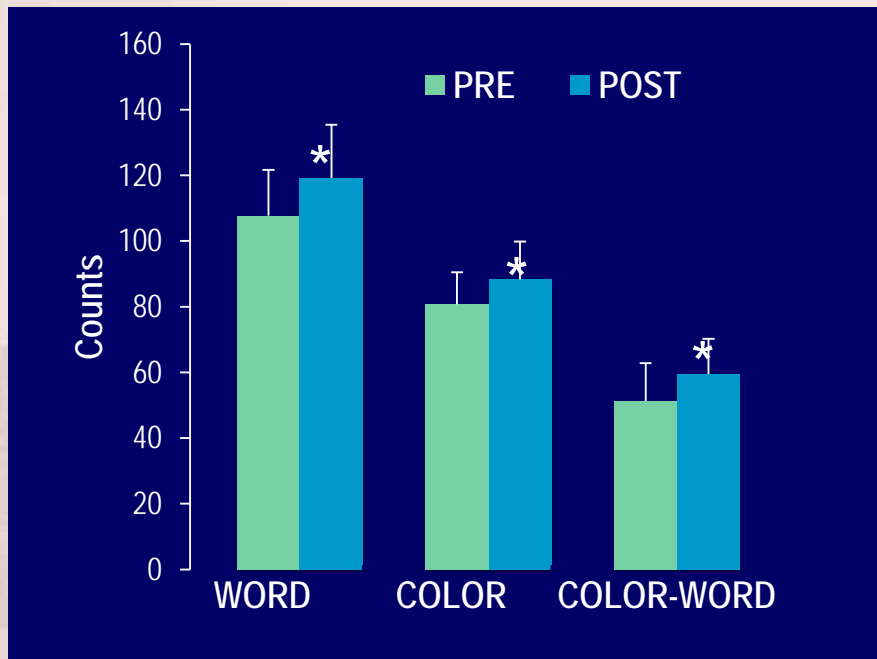


Acute Physical Activity Protocols



- ↓ Blood taken at baseline
- ↓ Arterial stiffness at baseline
- ↓ Vo_2 max at baseline
- ↓ Cognitive function tests before exercise and after exercise

Emerging Adults: Pre- vs Post- Cognitive Performance



* $p < 0.001$

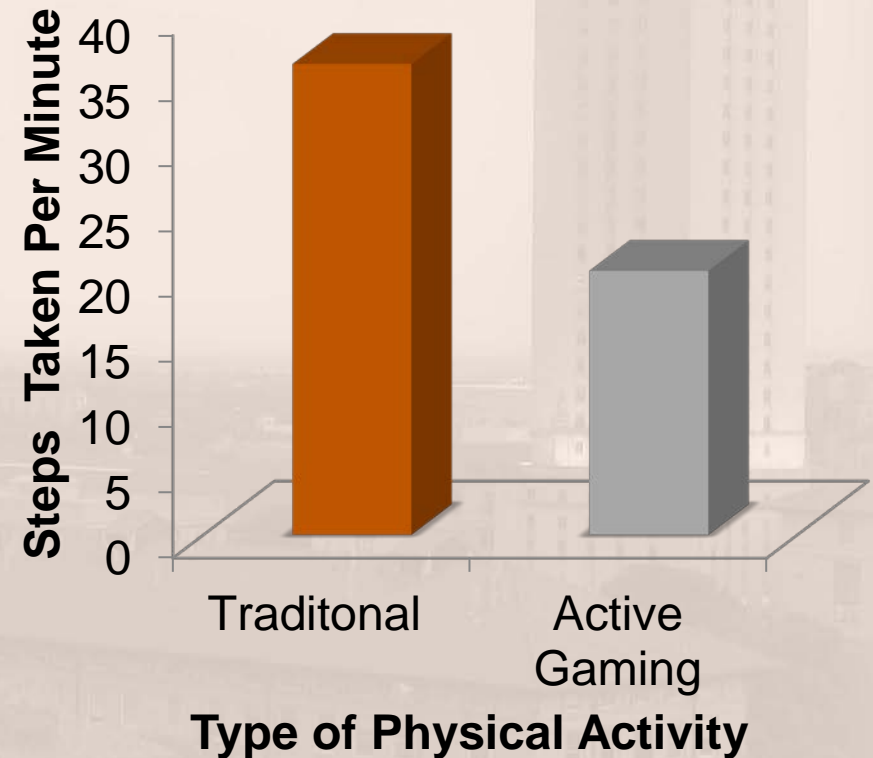
Hwang et al., 2013

Acute Dose - Response: Kinetic Kidz

Teacher-Led Fitness Activities	Active Gaming
1.43 ± 1.11 cal/kg/min	0.89 ± 1.00 cal/kg/min ^a

Note: a = p < .01

Centeio et al., 2011



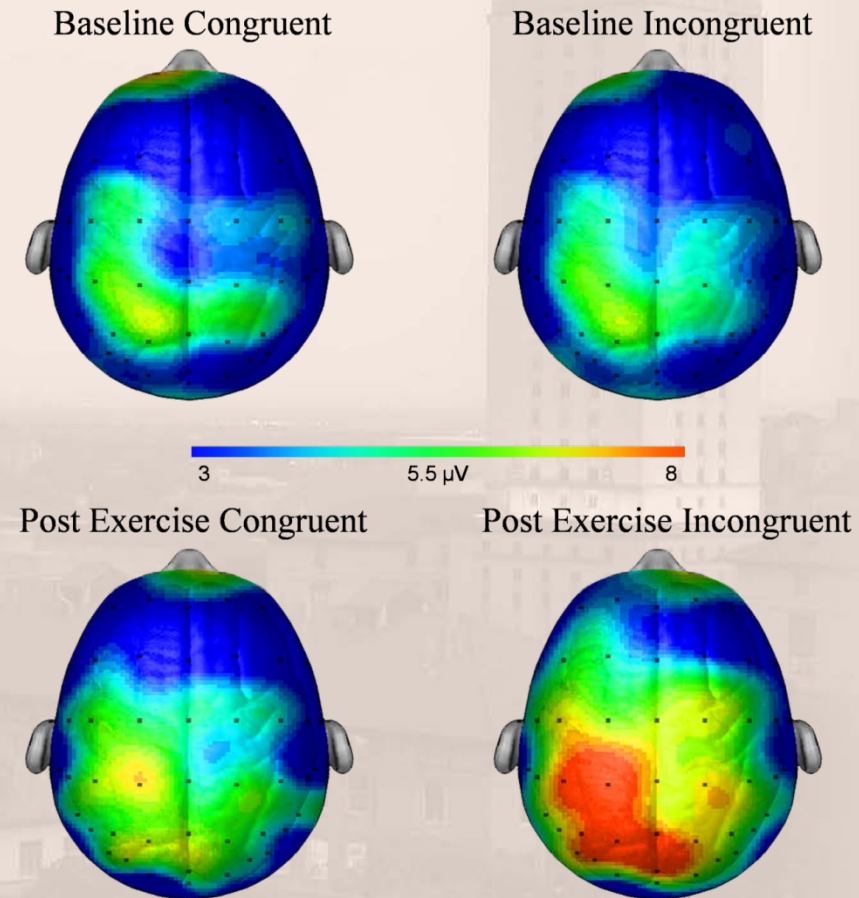
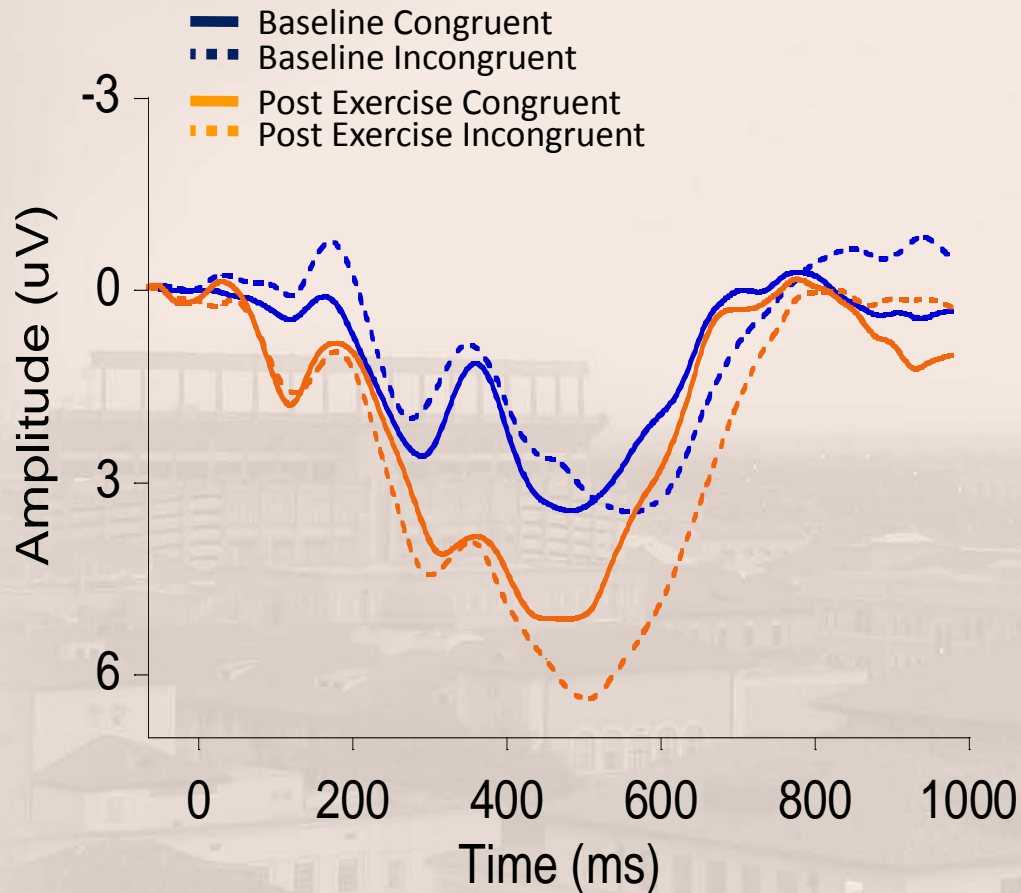
Acute Dose - Response: Kinetic Kidz

Teacher-Led Fitness Activities					Active Gaming				
Word	Color	C-W	Trails A	Trails B	Word	Color	C-W	Trails A	Trails B
76.69	62.56	40.15 ^a	22.97	67.40 ^a	78.97	62.08	42.15	22.71	71.83

Note: a = p < .01



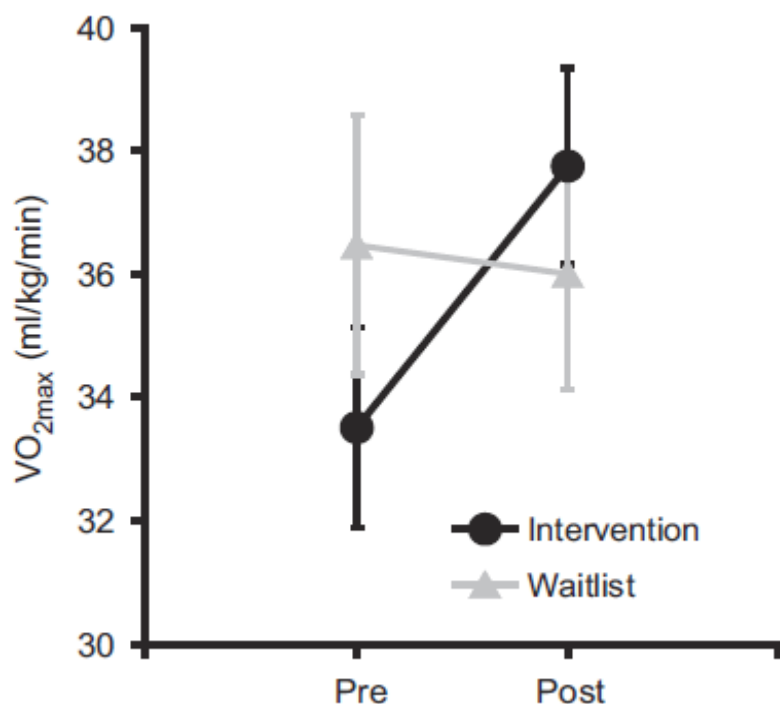
Acute Exercise in Preadolescent Children





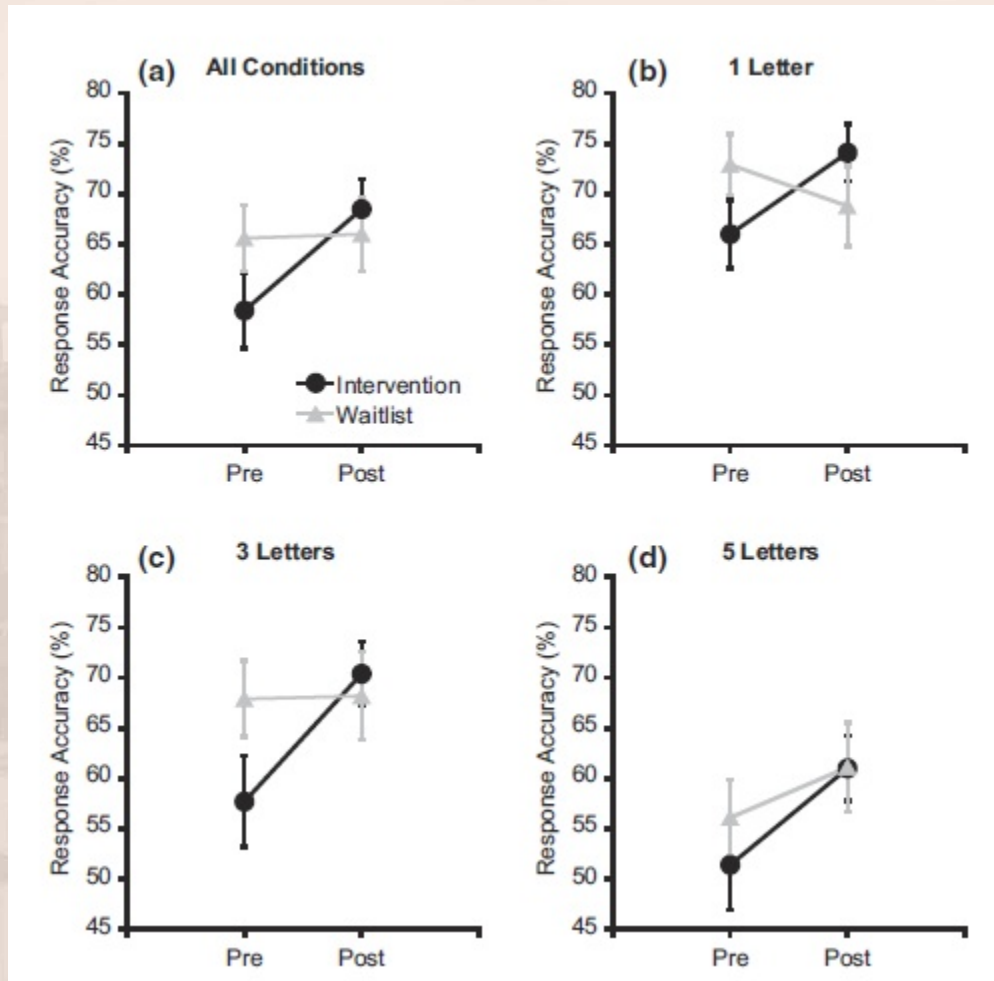
What are the effects of physical activity over time?

FITKids: Randomized Control Physical Activity Intervention



- Afterschool PA program (N = 221, ages 7-9); offered 70 minutes of MVPA; healthy snack & educational component
- Improved aerobic fitness (4.2 ml/Kg/min or 5.5% vs. <1% among waitlisted children)

FITKids: Randomized Control Physical Activity Intervention



FITKids: Inhibition Task

Pre-test

9 Months Later



The background of the slide is a faded, sepia-toned photograph of a university campus. A prominent feature is a tall, multi-story clock tower with a decorative top, located on the right side of the image. The tower has a series of windows and a small structure at the very top. The rest of the campus consists of various buildings of different heights and styles, some with arched windows. The overall atmosphere is historical and academic.

Professional Development and Changing Teacher & Student Behavior

Active + Healthy = Forever Fit

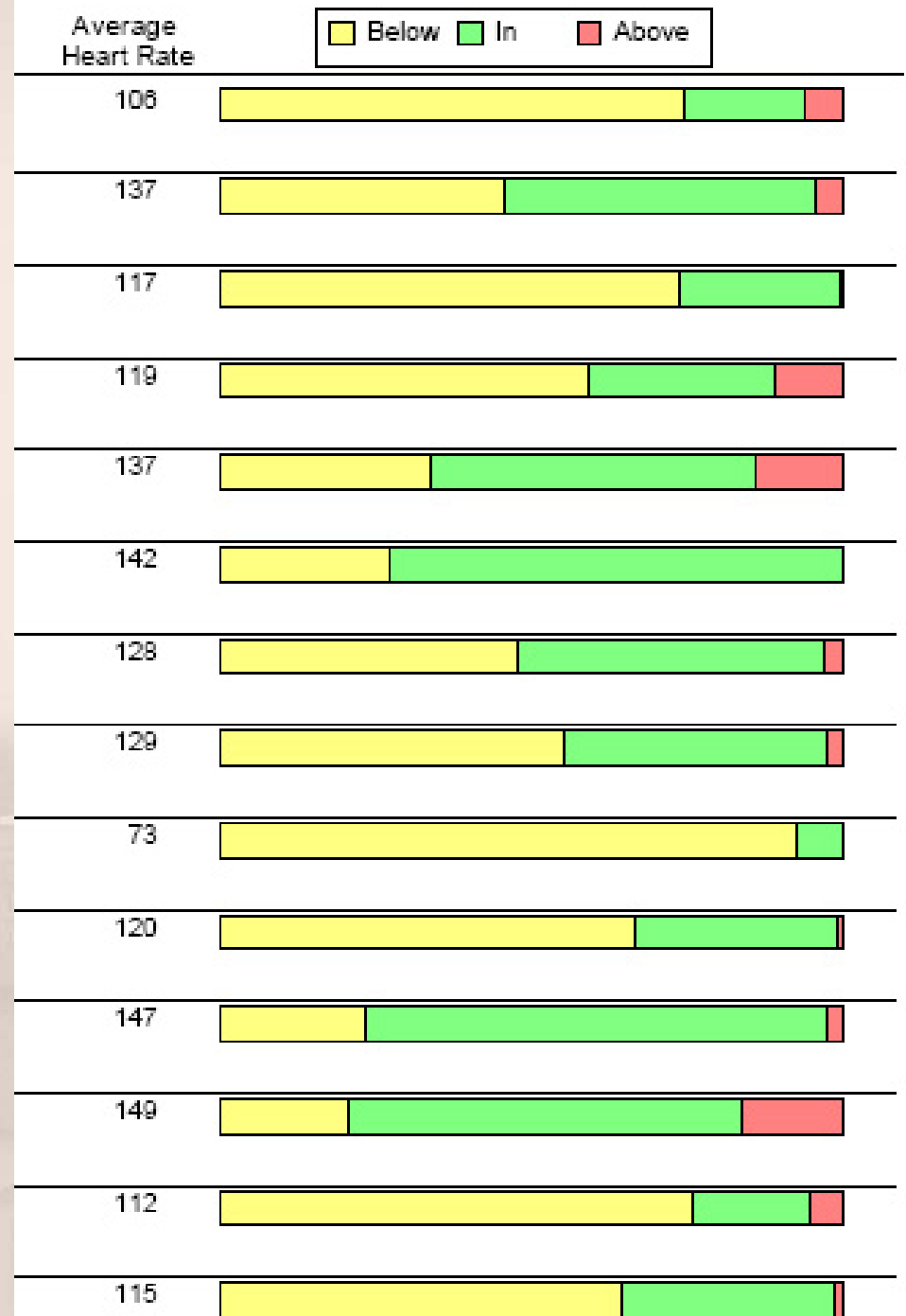


Professional Development

The students in this class just completed a Pickleball lesson. The graph on the right displays the average heart rates for the lesson.

Did the lesson improve cardiorespiratory endurance for most of the students? Why or why not?

Should the lesson be modified? If so, how?

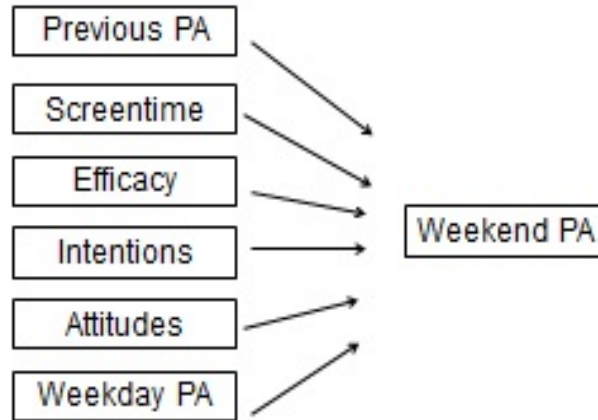


Physical Education Content

Hypothesized Predictors:

Controlling for:

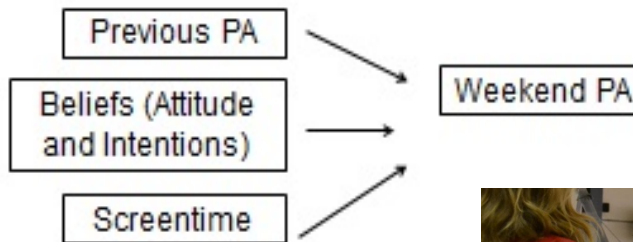
Gender
Age
Ethnicity
Free and Reduced Lunch
Fitness



Actual Predictors:

Controlling for:

Gender
Age
Ethnicity
Free and Reduced Lunch
Fitness



Odds Ratio for Healthy Fitness Zone

- Increasing PA opportunities during school can lead to greater fitness
- Improving muscle fitness and increasing weekday PA reduces the likelihood of unhealthy BMI
- Improving muscle fitness and increasing weekday PA enhances cardiorespiratory fitness

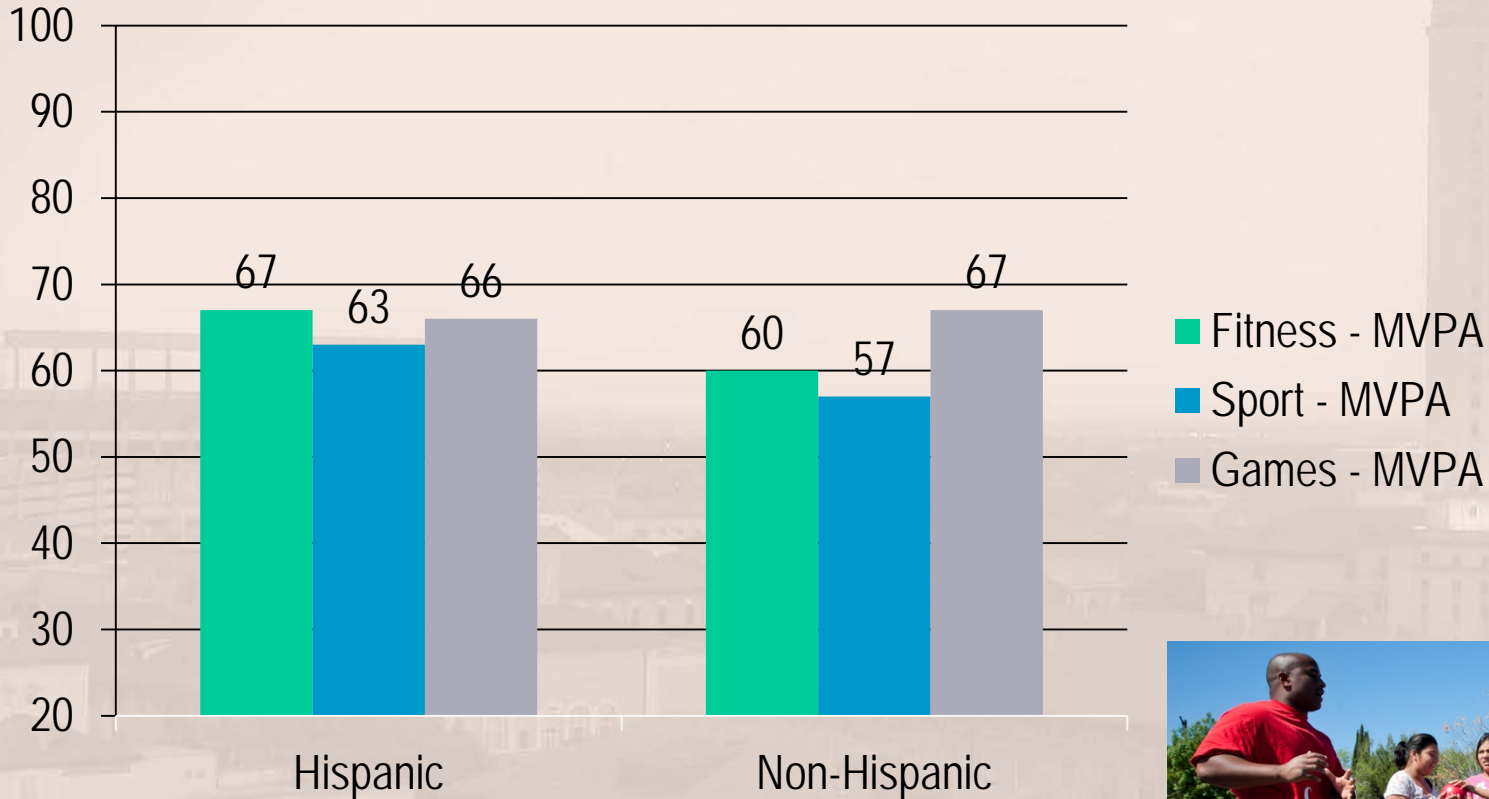
Four Ways to Differentiate:

1. Differentiating the content/topic
 - Use a pre test
2. Differentiating the process/activities
 - Teach using many different styles (i.e., problem solving, reciprocal...avoid direct instruction)
3. Differentiating the product
 - Have different expectations for different students (i.e., use heart rate as a measure of performance)
4. Differentiating by manipulating the environment or accommodating individual learning styles
 - Cooperative vs competitive; task vs ego motivation
 - Interest & readiness

Physical Fitness & Unexcused Absences

	Unstandardized	Standardized	p-value
PACER time	-.029	-.092	.034
One-mile run time	.351	.142	<.001
Grade	.950	.143	<.001
BMI	-.153	-.126	<.001
Male Gender	.566	.041	.238
White Race	-.391	-.022	.457
Free/Reduced Lunch	.372	.024	.419
Attitudes towards PA	-.015	-.028	.353

Culturally Relevant Pedagogy in PE



Sanogo & Castelli, 2013



Recommendations from the IOM

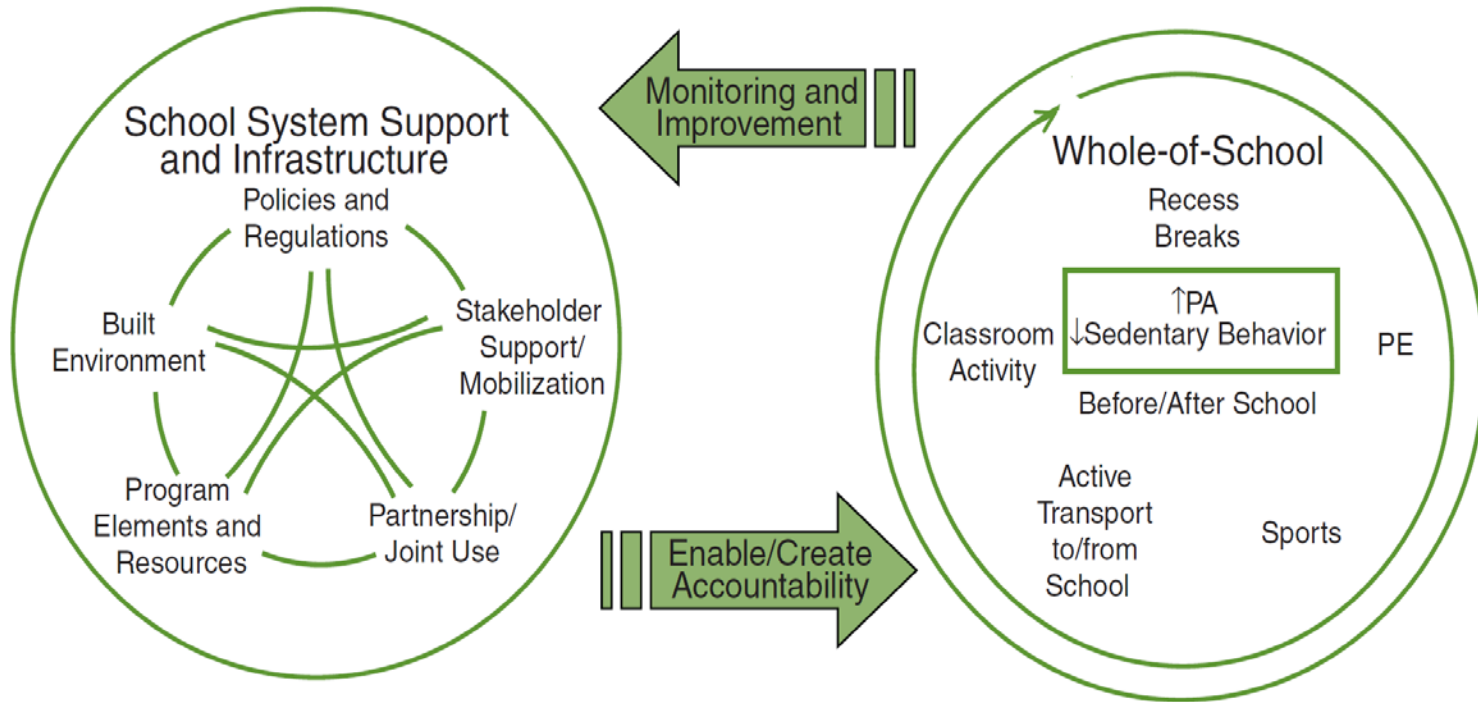


FIGURE 1-2 Integrated/coordinated approach to increasing physical activity among children and adolescents in the school environment before, during, and after school.

NOTE: PA = physical activity; PE = physical education.

How do we communicate with administrators, parents, & other stakeholders?

- Create a district one page fact sheet
- Prepare your elevator speech
- Be a wellness team member
- Get the PTA/PTO involved
 - Begin by educating the members about the benefits of PA
- Build ideal examples
 - Phone a friend



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