

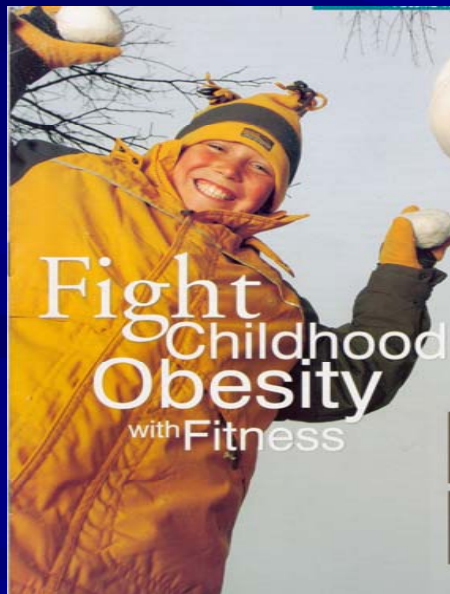
# Fit and Healthy Make the Mind Wealthy

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# Obesity Crisis

- One third of Kindergarten students are overweight and at risk for obesity, Type II diabetes, and cardiovascular disease
- Childhood obesity is a school issue



# Role of Schools in Public Health

- Comprehensive physical activity programming (PA)
- Quality, daily physical education (PE)
  - PE outcomes are associated with better performance in schools
- Unintended reduction of PA and PE time (~14%) (Pellegrini & Bohn, 2005)

# NASPE PE Standards (2004)

Standard 1: Demonstrates **competency** in motor skills and movement patterns needed to perform a variety of physical activities **(MC)**

Standard 3: Participates regularly in **physical activity (PA)**

Standard 4: Achieves and maintains a health-enhancing level of **physical fitness (PF)**

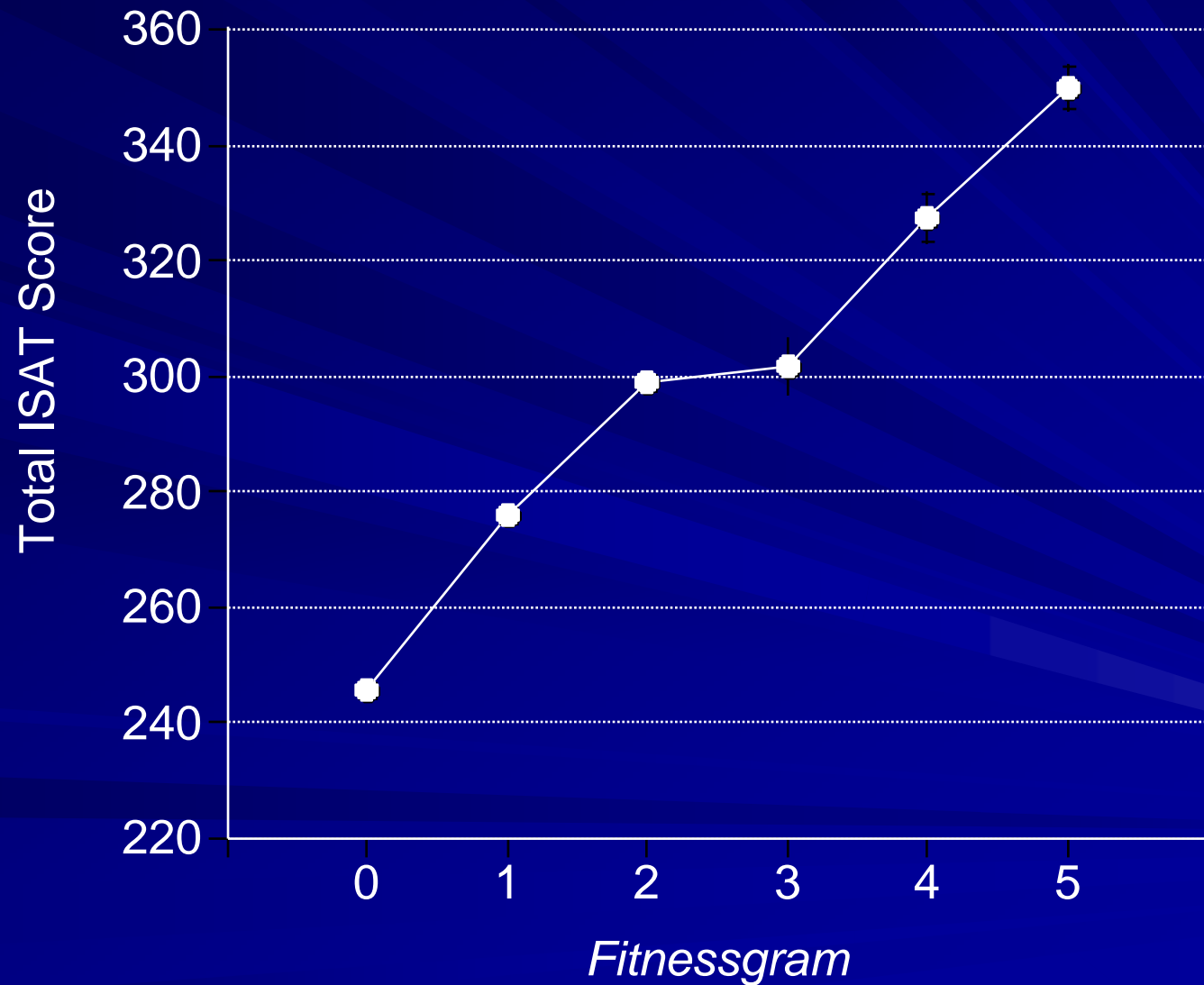
# Physical Fitness and Academic Performance

- Aerobic fitness has a general, positive effect on brain function and structure
- Specifically, children who are aerobically fit and are of normal body weight score better on standardized tests in reading and mathematics

– Castelli, Hillman, Buck & Erwin, 2007



# Physical Fitness & Test Performance



# Fitness and the Brain

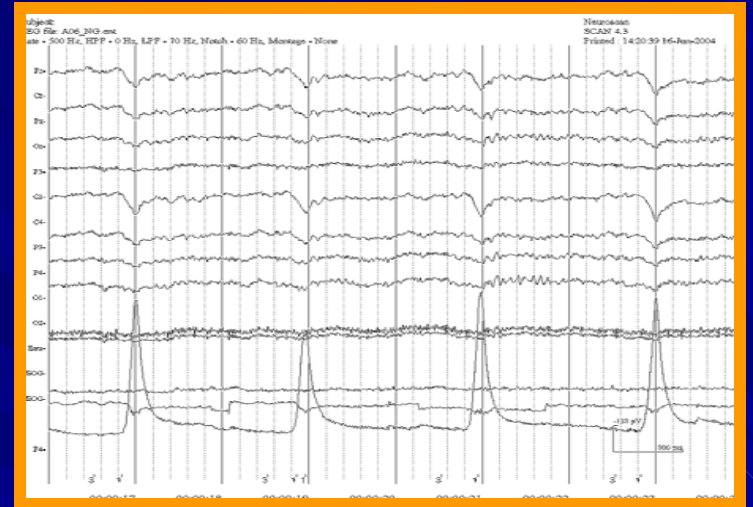
- As a follow-up to the academic achievement study, brain function was examined
- High/low fit children (developing brain) compared to high/low fit adults (peak function)

-(Hillman, Castelli, & Buck, 2005)

# Participants

| Measure         | Fit Adults                | Sedentary Adults         | Fit Children              | Sedentary Children        |
|-----------------|---------------------------|--------------------------|---------------------------|---------------------------|
| N               | 15 (6 m)                  | 12 (7 m)                 | 12 (7 m)                  | 12 (6 m)                  |
| Age             | 19.1 <sup>a</sup> (1.2)   | 19.5 <sup>a</sup> (1.5)  | 9.3 <sup>b</sup> (1.2)    | 9.8 <sup>b</sup> (.6)     |
| Pacer           | 56.5 <sup>a</sup> (9.7)   | 32.1 <sup>b</sup> (12.7) | 28.8 <sup>b</sup> (13.1)  | 12.6 <sup>c</sup> (5.3)   |
| K-BIT (IQ)      | 103.4 <sup>a</sup> (8.7)  | 104.5 <sup>a</sup> (6.8) | 116.7 <sup>b</sup> (12.7) | 108.7 <sup>b</sup> (11.0) |
| Educ. (yrs.)    | 14.7 <sup>a</sup> (1.0)   | 15.3 <sup>a</sup> (1.3)  | 5.0 <sup>b</sup> (.9)     | 5.3 <sup>b</sup> (.7)     |
| SES<br>(median) | 3.0 <sup>a</sup>          | 3.0 <sup>a</sup>         | 3.0 <sup>a</sup>          | 3.0 <sup>a</sup>          |
| BMI             | 21.8 <sup>a,b</sup> (1.7) | 24.5 <sup>a</sup> (4.2)  | 19.6 <sup>b</sup> (4.6)   | 21.9 <sup>a,b</sup> (6.4) |

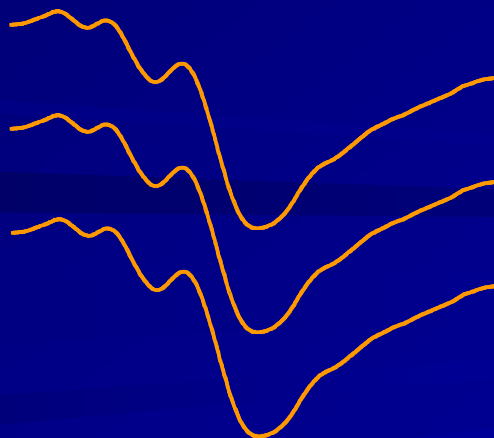
# Brain Event Related Potentials



Stimulus



Response



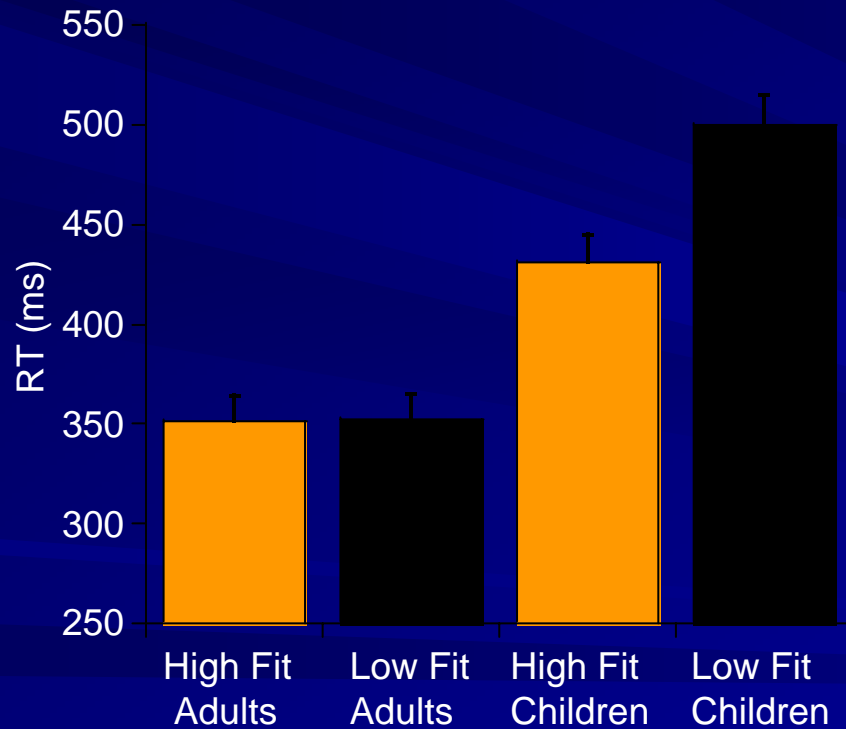
# Oddball Task

- Classic paradigm to elicit P3
- Based on stimulus probability
  - 80% non-target stimulus
  - 20% target (i.e., oddball) stimulus
- Button press to target-oddball stimulus

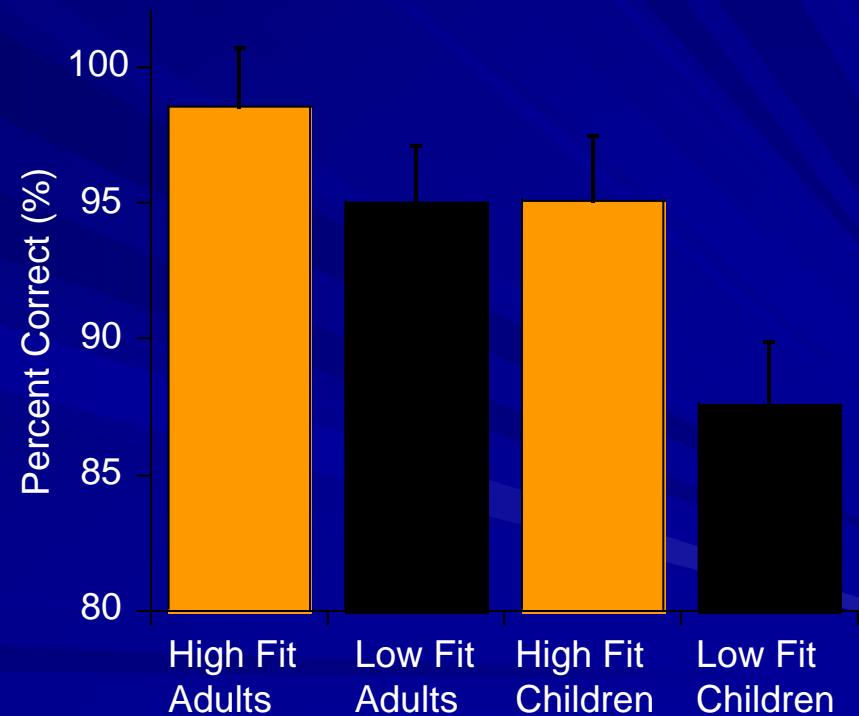


# Task Performance

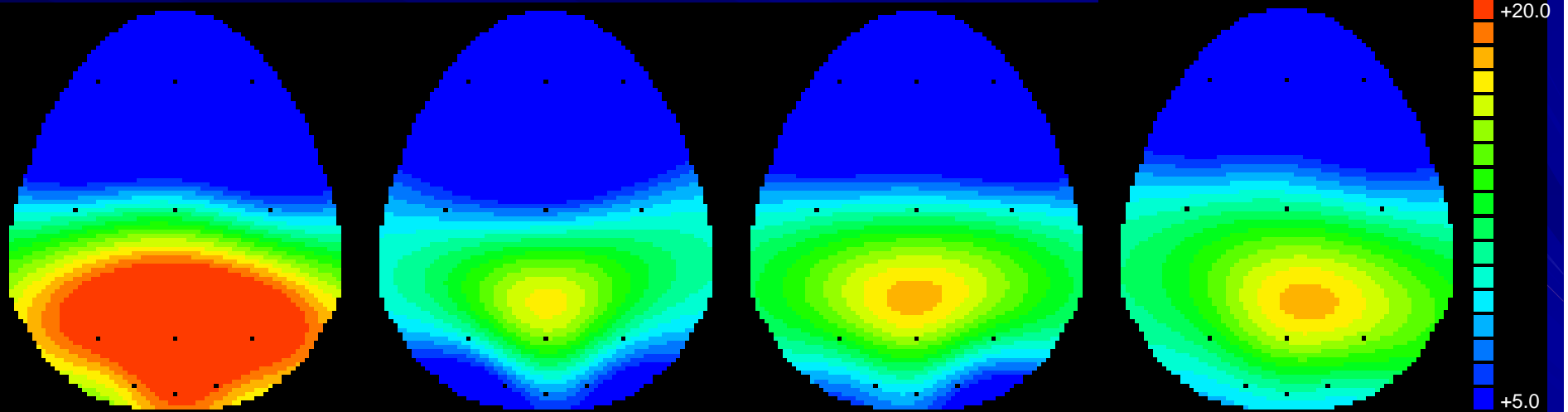
## Reaction Time



## Response Accuracy



# P3 Topography



Fit  
Children

Sedentary  
Children

Fit  
Adults

Sedentary  
Adults

# Physical Fitness and Cognitive Development

- Children who are fit respond more **quickly** and **accurately** to cognitive tasks than unfit children
- Fit children even perform as well as young adults on some cognitive tasks

# PA and Cognitive Performance

- PA has a positive effect on cognitive performance
- Adolescents who are vigorously active during PE get better grades in school
- Children who participate in PE are more likely to be active on their own time, particularly during the summer
- Acute physical activity (5-10 minutes) may also help performance in school

# Motor Competence and Academics

- Specific motor skills have been linked to academic performance
- Children who exhibit refined motor skills have higher achievement



# PE Outcomes are Associated with Improved Cognitive Performance

- There is **NO** evidence that participation in PE will have negative effects on academic achievement
- There **IS** robust evidence suggesting...
  - Brief bouts of PA during school
  - Regular PA engagement
  - Physical fitness
  - Motor competence...are associated with better performance in schools (i.e., testing, grades, attention)

# Recommendations

1. PE and PA need to become a national priority, particularly in children
2. Legislation be developed supporting quality, daily PE as part of a comprehensive PA program
3. Continued funding for research and development