

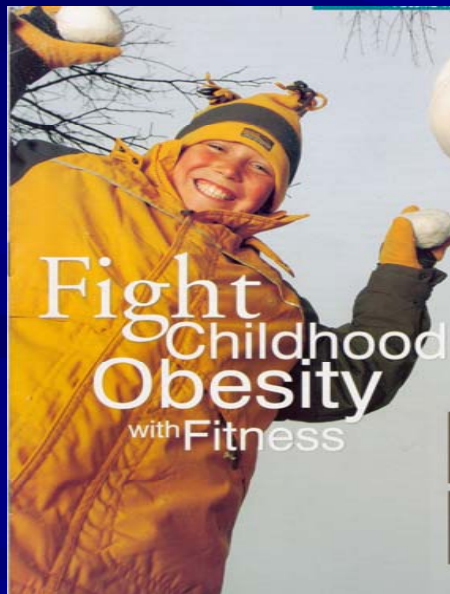
Fit and Healthy Make the Mind Wealthy

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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)**

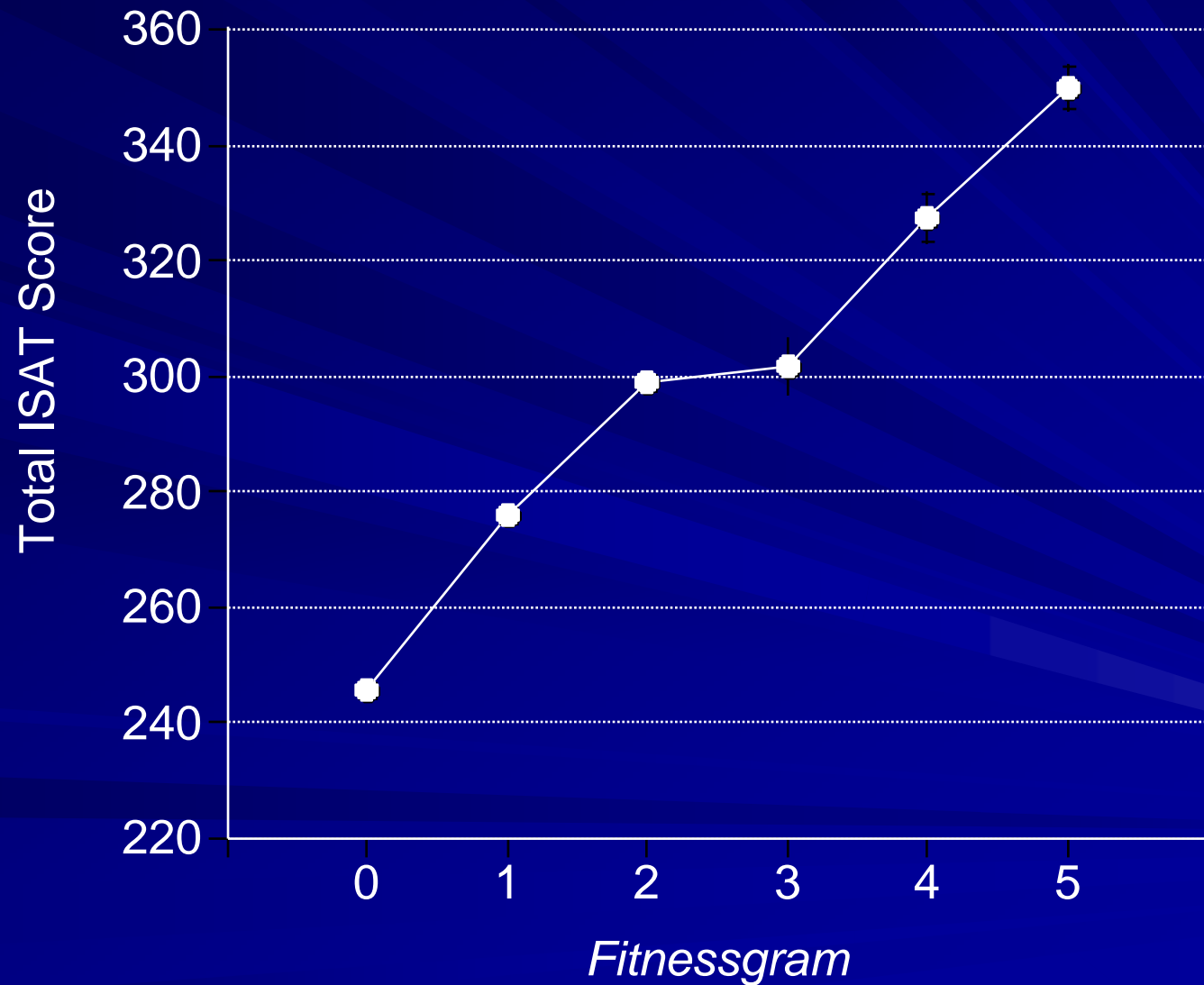
Physical Fitness and Academic Performance

- 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

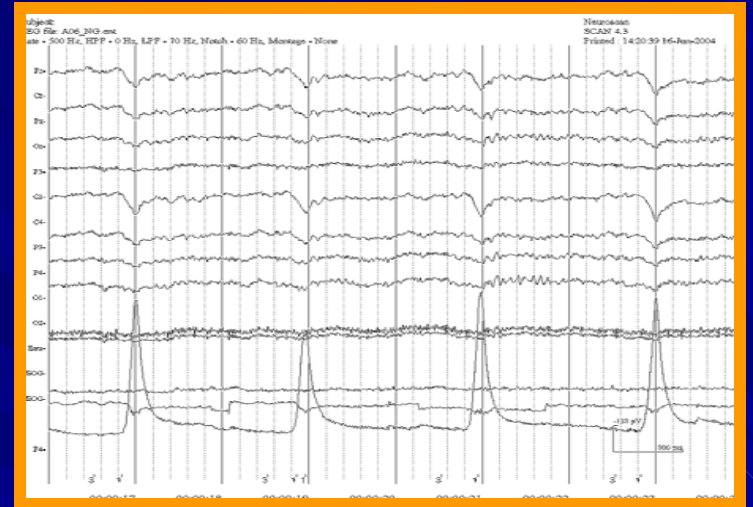
- As a follow-up to the academic achievement study, brain function was examined
- High/low fit children (developing brain) compared to high/low fit adults (peak function)

-(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 ^a (1.2)	19.5 ^a (1.5)	9.3 ^b (1.2)	9.8 ^b (.6)
Pacer	56.5 ^a (9.7)	32.1 ^b (12.7)	28.8 ^b (13.1)	12.6 ^c (5.3)
K-BIT (IQ)	103.4 ^a (8.7)	104.5 ^a (6.8)	116.7 ^b (12.7)	108.7 ^b (11.0)
Educ. (yrs.)	14.7 ^a (1.0)	15.3 ^a (1.3)	5.0 ^b (.9)	5.3 ^b (.7)
SES (median)	3.0 ^a	3.0 ^a	3.0 ^a	3.0 ^a
BMI	21.8 ^{a,b} (1.7)	24.5 ^a (4.2)	19.6 ^b (4.6)	21.9 ^{a,b} (6.4)

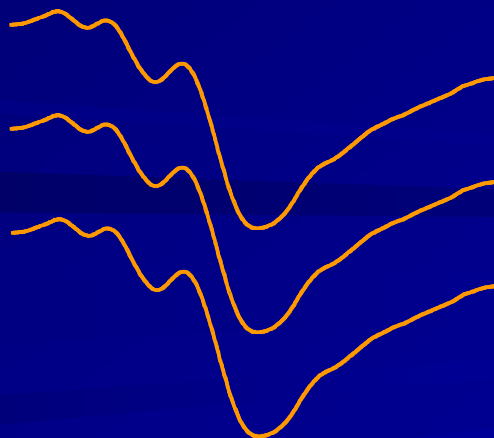
Brain Event Related Potentials



Stimulus



Response



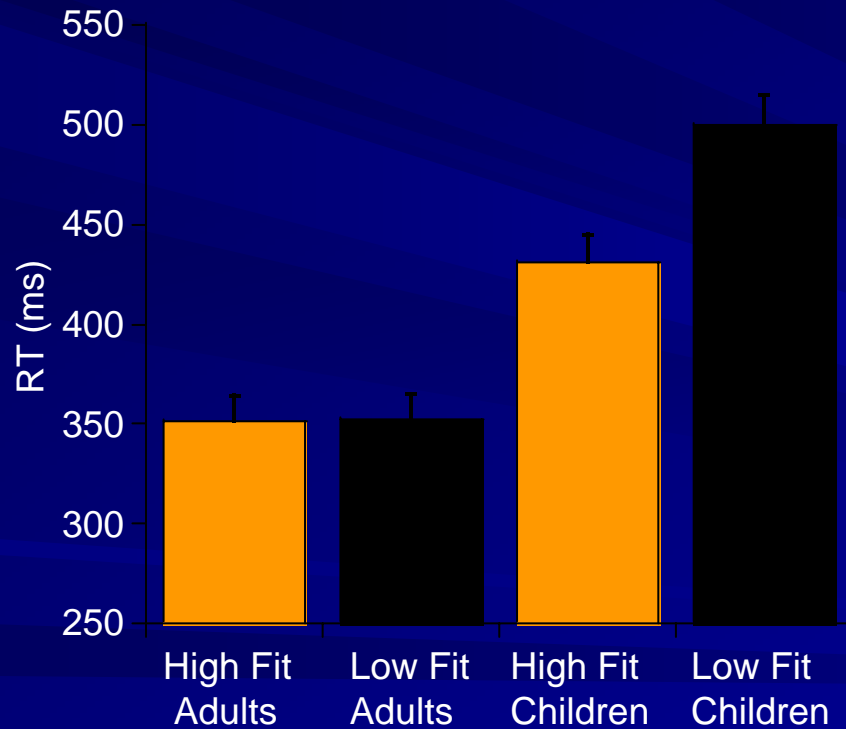
Oddball Task

- 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

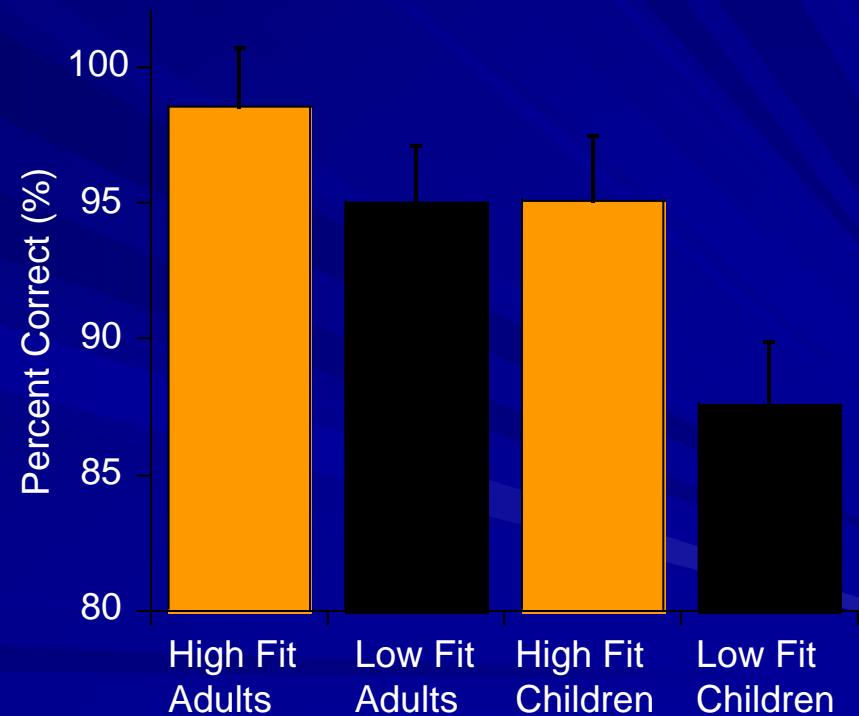


Task Performance

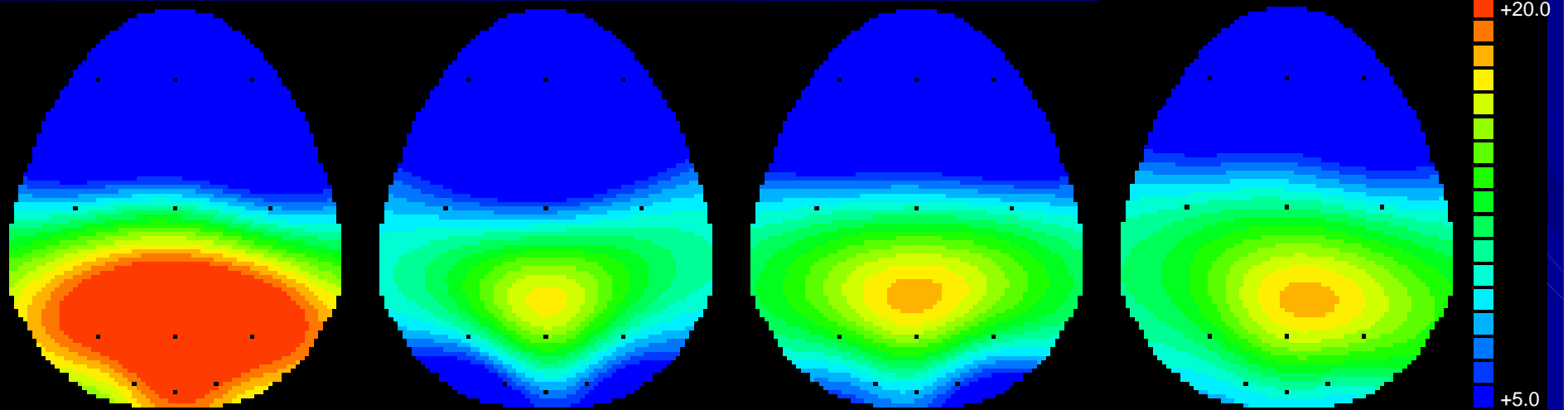
Reaction Time



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