Sedentary Behavior & Physical Activity: Independent & Interactive Influences on Health

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The report was presented to the Secretary of Health and Human Services and published in June 2008.
Health Benefits of PA in Children and Adolescents

- **Strong Evidence:**
  - Improved cardiorespiratory endurance & muscular fitness
  - Favorable body composition
  - Improved bone health
  - Improved cardiovascular & metabolic health biomarkers

- **Moderate Evidence:**
  - Reduced symptoms of anxiety & depression
Children and Adolescents (6-17 years)

- 1 hour (60 minutes) or more of PA every day
- Most of the 1 hour or more a day should be moderate- or vigorous-intensity PA
- Should include vigorous-intensity PA at least 3 days a week
Children and Adolescents (6-17 years)

- Muscle-strengthening:
  - At least 3 days of the week

- Bone-strengthening:
  - At least 3 days of the week
Prevalence of achieving 60 min/d of MVPA on all 7 days - YRBS 2009

CDC MMWR 2010;59(SS-5):1-146
Prevalence of attaining 60 min of MVPA per day - Accelerometry

Sedentary Behavior
Objectively Measured Physical Activity in Sixth-Grade Girls

Methods

- Cross-sectional study
- Six middle schools from each community:
  - Tucson, AZ
  - San Diego, CA
  - New Orleans, LA
  - Washington DC & Baltimore, MD
  - Minneapolis, MN
  - Columbia, SC
- Random sampling of eligible girls
- n = 1578

Pate et al. 2006
Measures

- Race/ethnicity
- Socioeconomic Status
  - Free or reduced-price school lunch
- Weight and height
- Physical Activity
  - Actigraph accelerometers
  - 6 complete days of data
  - 30-second intervals
Time spent in various intensities

- **Light**: 341.6 min/day (41.1%)
- **Moderate**: 18.1 min/day (2.2%)
- **Vigorous**: 5.6 min/day (0.7%)
- **Sedentary**: 459.9 min/day (55.7%)

Pate et al. 2006
Time spent in sedentary behavior (h/d) – NHANES 2008

Time spent in sedentary behavior (h/d) – ALSPAC

Mean hours/day

- Total Sed
- Weekend Sed
- Weekday Sed

Mitchell et al. *Obesity* 2009;17:1596-1602
Media Use in the U.S.

- **TV:**
  - 115.9 million homes have $\geq 1$ TV *
  - 2.5 TV sets per home *

- **Computers:**
  - 79% of adults use the internet ¶
  - Over 80% have computers; of those, 92% have internet access *

- **Mobile Phones:**
  - 228 million users (13 y+) *
  - 66% of users send text messages *

* The Nielsen Company 2010; ¶ Pew Research Center 2010
American Academy of Pediatrics

- Children < 2 years of age
  - No television viewing

- Children ≥ 2 years of age
  - Limit screen time to < 2 hours per day

- Children should not have televisions in their bedrooms

AAP Pediatrics 2001;107:423-426
Television Ownership of Families with Children (0-6 y)

TV Viewing Habits of Children (0-6 y)

- Most children watched TV on a “typical day”
  - 63% of 0-2 y olds
  - 82% of 3-4 y olds
  - 78% of 5-6 y olds

- Average of 1 hour 19 minutes/day

Sedentary Behavior & BMI

Purpose: To determine if time spent in sedentary behavior is associated with change in BMI from age 9-15

Sample: NICHD Study of Early Child Care & Youth Development (n=1,364)

Dependent Variable: BMI

Independent Variable: Sedentary behavior
  - Accelerometry, < 100 counts/min

Covariates: MVPA, hours of sleep, healthy eating score, race, gender, maternal education

Slide courtesy of Dr. Jonathan Mitchell
Sedentary Behavior & BMI

- High and Low Sedentary Behavior

<table>
<thead>
<tr>
<th></th>
<th>10&lt;sup&gt;th&lt;/sup&gt; Percentile</th>
<th>25&lt;sup&gt;th&lt;/sup&gt; Percentile</th>
<th>50&lt;sup&gt;th&lt;/sup&gt; Percentile</th>
<th>75&lt;sup&gt;th&lt;/sup&gt; Percentile</th>
<th>90&lt;sup&gt;th&lt;/sup&gt; Percentile</th>
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<tbody>
<tr>
<td>Intercept</td>
<td>3.83 (3.66, 4.00)</td>
<td>4.51 (4.43, 4.59)</td>
<td>5.20 (5.08, 5.32)</td>
<td>6.05 (5.93, 6.18)</td>
<td>6.99 (6.72, 7.26)</td>
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<tr>
<td>Age</td>
<td>0.08 (-0.04, 0.20)</td>
<td>0.09 (0.01, 0.17)</td>
<td>0.17 (0.09, 0.26)</td>
<td>0.23 (0.12, 0.34)</td>
<td>0.22 (0.02, 0.42)</td>
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<tr>
<td>Age&lt;sup&gt;2&lt;/sup&gt;</td>
<td>0.03 (0.01, 0.05)</td>
<td>0.04 (0.02, 0.06)</td>
<td>0.04 (0.03, 0.06)</td>
<td>0.05 (0.02, 0.08)</td>
<td>0.06 (0.03, 0.09)</td>
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10<sup>th</sup> Percentile
- 9y: 3.8 hrs/d
- 11y: 4.1 hrs/d
- 12y: 5.4 hrs/d
- 15y: 5.4 hrs/d

90<sup>th</sup> Percentile
- 9y: 7.0 hrs/d
- 11y: 7.7 hrs/d
- 12y: 8.2 hrs/d
- 15y: 10.5 hrs/d

Slide courtesy of Dr. Jonathan Mitchell
Sedentary Behavior & BMI

- BMI distributions

Slide courtesy of Dr. Jonathan Mitchell
Summary

- Reducing the time children spend in sedentary behavior at the population level could shift the upper tail of the BMI distribution to the left.

- The association between sedentary behavior and BMI remained after adjusting for MVPA, sleep quality and health eating scores.

- Increased energy expenditure with less time spent in sedentary behavior is a likely mechanism to explain the observations.
Systematic review of sedentary behavior & health indicators in school-aged children & youth

  - Health indicators
    - Body composition
    - Fitness
    - Metabolic syndrome & cardiovascular disease
    - Self-esteem
    - Pro-social behavior
    - Academic achievement
- 232 studies, most used TV viewing time
- Children & youth ages 5-17
Results

- Sedentary behavior > 2 hrs/wk associated with
  - Unfavorable body composition
  - Decreased fitness
  - Lower self-esteem scores & pro-social behavior
  - Lower academic achievement

- Metabolic syndrome & CVD - ↑ TV time associated with ↑ health risk, but insufficient evidence

- Meta-analysis of RCTs with change in BMI (n=4)
  - ↓ TV time is associated with ↓ BMI, -0.89 kg/m²

Tremblay et al. *Int J Behav Nutr Phys Act* 2011;8:98