Statewide Physical Fitness Testing: A BIG Waist or a BIG Waste?

James R. Morrow, Jr.
University of North Texas

RQES Lecture
AAHPERD – Tampa FL
April 3, 2009

RQES Lecturers

• Kathleen Williams
  – UNC-Greensboro

• Deborah Feltz
  – Michigan State University

• Barbara Ainsworth
  – Arizona State University

RQES Editors-in-Chief

1989-1993

Mitchell, Elmer D. 1930-1943
Wibel, Mary 1943-1950
Perlmutter, Jerome H. 1950-1951
Wright, Ella H. 1951-1958
Rosenberg, Nancy 1958-1965
Bookwalter, Carolyn 1965-1969
Mitchem, John 1969-1972
Scott, M. Gladys 1973-1977
Safrit, Margaret J. 1977-1980
Falls, Jr., Harold B. 1980-1983
Thomas, Jerry R. 1986-1989
Morrow, Jr., James R. 1989-1993
Weiss, Maureen R. 1993-1995
Magill, Richard 1996-1999
Reeve, T. Gilmour 1999-2002
Silverman, Stephen 2002-2005
Williams, Kathleen 2005-present
Newspaper Headlines

• Cold spell tied to temperature change
• Tornado hits cemetery, hundreds dead
• Plane crash due to problem, experts say
• Baby born 10 months premature

Some Obesity Headlines

• New study of obesity looks for larger test group
• TV ads boost eating of obese children
There is not enough evidence to recommend for or against school-based body mass index measurement programs as an effective strategy for preventing or reducing childhood obesity. Decision makers need to consider the pros and cons. If implemented, these programs should be part of a comprehensive approach to address obesity.

Cardiorespiratory fitness levels among US youth 12 to 19 years of age: Findings from the 1999-2002 National Health and Nutrition Examination Survey.

- Males higher than females
- No difference across race/ethnicity
- Older males higher
- Younger females higher

Approximately 1/3 don’t meet cardiovascular standards

Fitness Achievement and School Environment

- **Academic Achievement (TAKS)**
  - CV = .54
  - BMI = .30

- **School Attendance**
  - CV = .52
  - BMI = .18

- **Negative School Incidents**
  - CV = -.52
  - BMI = -.24

Controlled for SES, minority status, school size.
California
English-Language Arts & FITNESSGRAM® HFZs Achieved

California
MATH & FITNESSGRAM® HFZs Achieved

Pinellas County
Florida Comprehensive Achievement Test (FCAT) & FITNESSGRAM® HFZs Achieved
Physical Fitness Testing
50 Years of History

James R. Morrow, Jr.
Christine Spain
Marilu D. Meredith
B. Don Franks
Weimo Zhu

Statewide Physical Fitness Testing:
A BIG Waist or a BIG Waste?
Physical Fitness Testing of Children: A 30-Year History of Misguided Efforts


Percentage of Test Failures

Flexibility Test Failures

Weakness Test Failures

Incidence of Test Failures

Children/Adult Physical Activity/Fitness

Nationwide Physical Fitness Tracking

- PCPFS/AAHPERD
  - 1958
  - 1965
  - 1975
  - 1985
Nationwide Physical Fitness Testing/Tracking

- **NCYFS I**
  - 1984 (N = 8,800)
  - Grades 5-12

- **NSPFS**
  - 1985 (N = 18,857)
  - Ages 6-17

- **NCYFS II**
  - 1987 (N = 4,678)
  - Ages 6-9

Fitness Test Development
1958-2008

Statewide
- California
- Illinois
- Indiana
- New York
- Oregon
- South Carolina
- Texas
- Vermont
- Washington

National
- AAHPERD Youth Fitness
- AAHPERD Health-Related Fitness
- AAHPERD College Age Health-Related Fitness
- Fit Youth Today
- AAU Fitness Test
- FITNESSGRAM®
- President’s Challenge

Interest in Statewide Fitness Testing

- Alabama
- Arkansas
- California
- Colorado
- Delaware
- Florida
- Georgia
- Maryland
- Missouri

- New York (City)
- North Carolina
- Oklahoma
- South Carolina
- Texas
- Washington
- West Virginia
- Wisconsin

Why?
Arkansas BMI Assessments

Physical Activity “Risk” Generalization

Trend of Health Care Costs in the U.S.

Overweight U.S. Children and Adolescents

Source: Centers for Medicare & Medicaid Services, Office of Actuary

Ogden et al., JAMA, October 9, 2002, p. 1728
Overweight U.S. Children and Adolescents
Male (BMI > 95%ile)

Ogden et al., JAMA, October 9, 2002, p. 1728

Overweight U.S. Children and Adolescents
Female (BMI > 95%ile)

Ogden et al., JAMA, October 9, 2002, p. 1728

Childhood Overweight Prevalence (CDC)

http://www.cdc.gov/nccdphp/dnpa/obesity/childhood/prevalence.htm

YRBSS Obesity Trends
Grades 9-12

Students ≥ 95% compared to reference data
Overweight in Youth

- Tripled in past 3 decades
- At least 15% aged 6-19 are overweight
- 30% of overweight children meet criteria for Metabolic Syndrome
- Disproportionate in underserved populations

Odds of Childhood Obesity Tracking into Adulthood

- Whitaker et al., NEJM, 1997, 337:869-873
- OR
- Obese or very obese
- Obese
As Part of War on Fat, New Fitness Test for Youngsters

AS PART OF THE CITY GOVERNMENT'S CRACKDOWN ON fat, the schools chancellor, Joel Klein, announced a new fitness test for students yesterday--and the food industry raised alarms about the specter of a legislative assault on fast food.

With more than one in four city elementary students considered obese, Mr. Klein is expanding a new program to test students' strength and speed and link the information to their academic achievement.
Would you care or say the same things about academic performance in schools?

Interest in Statewide Fitness Testing

- Alabama
- Arkansas
- California
- Colorado
- Delaware
- Florida
- Georgia
- Maryland
- Missouri
- New York (City)
- North Carolina
- Oklahoma
- South Carolina
- Texas
- Washington
- West Virginia
- Wisconsin

Why do Statewide Testing?

- Health Status
  - Overweight/Obesity
  - Aerobic fitness
    - CVD
  - Diabetes
  - Musculoskeletal fitness

Missing Data

- Health Status
  - Aerobic fitness
    - CVD
      - Pate paper most recent
  - Musculoskeletal fitness
    - Strength
    - Endurance
    - Flexibility
    - Physical Activity
Why do Statewide Testing?

**Individual**
- Status
- Risk
- Change

- Variables
  - Physical
  - Activity
  - School
  - Academic performance
  - Classroom discipline
  - Absences

**State/Nation**
- Surveillance
  - Status
  - Risk
  - Change

- Variables
  - Physical
  - Fitness
  - Activity
  - School
  - ??

Statewide Testing Issues

- Teacher training
- Student preparation
- Test reliability
- Test validity
- Large group testing issues
  - Testers
  - Participants
  - Test-related
  - Environment

Florida Department of Education
Physical Education Report and Recommendations – March 2005

Assess the availability of fitness assessment programs, such as the President’s Challenge Physical Fitness Program, which could be adopted by schools or an entire school district in order to **provide information regarding student fitness**:

Determine the methods of providing **feedback to a parent** through a student assessment report that would summarize a student’s results and the **school’s results** as set forth in an assessment tool, such as the FITNESSGRAM or the School Health Index of the Centers for Disease Control and Prevention;

**Controlled settings**
- Well-trained:
  - Teachers
  - Administrators
- Prepared students

**Comparison**
- Individual
- National
- Statewide

Morrow – AAHPERD 2009 – Page #14
Texas Youth Evaluation Project (2008) – N = 2,596,565

<table>
<thead>
<tr>
<th>Grade</th>
<th>Total # of Students</th>
<th>Fitnessgram® Test Achieving “Healthy Fitness Zone” in All 5 Tests %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>Girls</td>
</tr>
<tr>
<td>3</td>
<td>327,946</td>
<td>160,929</td>
</tr>
<tr>
<td>4</td>
<td>320,123</td>
<td>157,232</td>
</tr>
<tr>
<td>5</td>
<td>314,035</td>
<td>154,865</td>
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<tr>
<td>6</td>
<td>292,840</td>
<td>144,379</td>
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<tr>
<td>7</td>
<td>281,334</td>
<td>138,285</td>
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<tr>
<td>8</td>
<td>259,802</td>
<td>126,183</td>
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<tr>
<td>9</td>
<td>263,517</td>
<td>126,607</td>
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<tr>
<td>10</td>
<td>212,562</td>
<td>103,453</td>
</tr>
<tr>
<td>11</td>
<td>178,583</td>
<td>87,771</td>
</tr>
<tr>
<td>12</td>
<td>146,514</td>
<td>72,816</td>
</tr>
</tbody>
</table>

Cardiovascular Fitness by Grade
% Achieving “Healthy Fitness Zone”

Body Mass Index (BMI) by Grade
% Achieving Healthy Fitness Zone
<table>
<thead>
<tr>
<th>Grade</th>
<th>5th</th>
<th>6th</th>
<th>7th</th>
<th>8th</th>
<th>9th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls</td>
<td>32.09</td>
<td>77.4</td>
<td>23.03</td>
<td>22.59</td>
<td>20.93</td>
</tr>
<tr>
<td>Boys</td>
<td>27.64</td>
<td>78.56</td>
<td>17.29</td>
<td>17.1</td>
<td>16.93</td>
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</tbody>
</table>

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<th>6th</th>
<th>7th</th>
<th>8th</th>
<th>9th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls</td>
<td>212,562</td>
<td>193,455</td>
<td>109,109</td>
<td>27,222</td>
<td>11.94</td>
</tr>
<tr>
<td>Boys</td>
<td>27,222</td>
<td>193,455</td>
<td>109,109</td>
<td>211,562</td>
<td>11.94</td>
</tr>
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<th>7th</th>
<th>8th</th>
<th>9th</th>
</tr>
</thead>
<tbody>
<tr>
<td>Girls</td>
<td>179,583</td>
<td>87,778</td>
<td>90,805</td>
<td>20,055</td>
<td>10.45</td>
</tr>
<tr>
<td>Boys</td>
<td>20,055</td>
<td>87,778</td>
<td>90,805</td>
<td>179,583</td>
<td>10.45</td>
</tr>
</tbody>
</table>
**Georgia Youth Fitness Assessment**

Grades 5 and 7 (N = 5,248)

<table>
<thead>
<tr>
<th>Test</th>
<th>% NOT Achieving HFZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI</td>
<td>35</td>
</tr>
<tr>
<td>PACER</td>
<td>52</td>
</tr>
<tr>
<td>MSEF</td>
<td>23</td>
</tr>
<tr>
<td>MVPA</td>
<td>22</td>
</tr>
</tbody>
</table>

% of NOT achieving HFZ: Failed ≥ 2 MSEF < 60 min/day MVPA


**Significance**

- Texas
  - N > 2,600,000 (3rd - 12th)
- California
  - N = 1,000,000 (5th, 7th, & 9th)
- New York City
  - N = 600,000 (K - 12th)
- Missouri
  - N = 60,000 (5th & 9th)
- Georgia
  - N = 5,248 (5th & 7th)

p ≤ .0000000000001


**What do you interpret as fit?**

- Body composition (BC)
- Aerobic capacity (AC)
- Musculoskeletal (MSF)
  - Which tests?
    - BC & AC
    - 6 of 6 HFZ
    - 5 of 6 HFZ
    - 4 of 6 HFZ
    - 3 of 6 HFZ

Powell et al., 2009 AJPM, 36(4), 304-310
Psychometric Considerations

- **Reliability**
  - Body Composition
  - Aerobic Capacity
  - Musculoskeletal Fitness

- **Validity**
  - Body Composition
  - Aerobic Capacity
  - Musculoskeletal Fitness

Item Reliability

\[ r_{xx} = \frac{\sigma_l}{\sigma_o} \]

- **Aerobic Capacity**
  - N = 23
  - \( r_{xx'}(P50) \approx .84 \)

- **Body Composition**
  - N = 11
  - \( r_{xx'}(P50) \approx .86 \)

- **Musculoskeletal Fitness**
  - N = 106
  - \( r_{xx'}(P50) \approx .91 \)

Item Validity

- **Aerobic Capacity**
  - N = 31
  - \( r_{xy}(P50) \approx .72 \)

- **Body Composition**
  - N = 3
  - \( r_{xy}(P50) \approx .76 \)

- **Musculoskeletal Fitness**
  - N = 79
  - \( r_{xy}(P50) \approx .39 \)

Battery Reliability & Validity

- **Safrit & Wood**
  - RQES, 1987, p. 160-167

- **Validity**
  - Content
  - Concurrent
  - Predictive
    - Morbidities
    - Mortality
    - Construct
What battery/items?

- Performance fitness
  - Endurance
  - Speed
  - Agility
  - Strength

- Health-Related fitness
  - Aerobic Capacity
  - Body Composition
  - Musculoskeletal

- Functional fitness

Commonalities Among Fitness Types

Overlap of Fitness Types

Morrow et al., 2009, RQES.
Teacher Training

- Interest
- Time
- Money
  - Equipment
  - Training
- Methods
  - None
    - Read the manual
    - Train the trainer
    - Skilled?
  - Reading
  - In person
  - On-line
- Logistics (plan ahead)
  - Fire drill
  - CD skips
  - Call the police!

Student Performance

- Interest
  - Most physical activity they get
  - Instructional units
    - Fitness/Physical Activity/Wellness
- Motivation
  - Teachers/Students
- Practice
  - Proper/improper
    - Specificity
- Scoring
  - Teacher
  - Student
  - Partner
  - Volunteers
  - Testing teams

Changes in Fitness Importance Across Age

Performance-related fitness

Health-related fitness

Functional fitness

Continuing Issues

Logistic
- Battery
- Scheduling
- Equipment
- Logic
- Theory
- Policies
- Support
- Politics

People
- Students
- Parent
- Teachers
- Administrators
- Politicians
- Constituencies
  - Art
  - Music
Student/Teacher “Excitement”?  

• Elementary  
  – Much practice  
  – “Can we do it again?”  
  – Want a “true” score

• Secondary  
  – “Where can I hide?”  
  – Some females don’t want to be weighed.  
  – Set goals for HFZ.  
  – Others do only minimum!

• Teacher  
  – Viewed as “punishment” – state requirement  
  – Some enthusiastic  
  – Some “grade” students  
  – “Herding cattle” – test entire school

Results Confidence  

• Psychometrics  
  – Reliability  
  – Validity  
  – Objectivity

• Scoring  
• Interpretation  
• Use  
• Translation  
  – Teacher → Student → Parents

Score Error Sources

• Tester  
  – Administrator  
  – Scorer  
  • Experience  
  • Skill

• Participant  
  – Tired  
  – Unmotivated  
  – Nervous  
  – Ill  
  – Peer pressure  
  – Intimidation  
  – Self-consciousness

• Test-related  
  – Instructions  
  – Equipment  
  • None  
  • Faulty

• Environment  
  – Weather  
  – Surfaces  
  – Cultural context  
  – Peer pressure


Ongoing Research  
HFZ Reliability & Validity
Positives & Negatives

- Convey important information
  - Parents
  - Students
  - Teachers
  - Administrators
- Powerful change agent
  - Newspaper Headlines
  - Influence decision makers
    - More MONEY for PE
    - More TIME for PE
  - Influence curricula
  - Budget
- Opportunities

- Bad data collection
- Data entry
- Convey WRONG information
- Weak/Poor data
- Poor interpretation
  - Causality

More Legislation - 2009

SB 891

A BILL TO BE ENTITLED
AN ACT

relating to the public school physical education curriculum.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

SECTION 1. Section 28.002, Education Code, is amended by
adding Subsection (a)(2)(C) to read as follows:

(2) The physical education curriculum required under this
subsection (a)(2)(C) must be sequential, developmentally
appropriate, and designed, implemented, and evaluated to
enable students to develop the motor, self-management, and
social skills, knowledge, attitudes, and confidence necessary to participate in

More Legislation - 2009

HB 229

A BILL TO BE ENTITLED
AN ACT

To amend Part 3 of Article 16 of Chapter 2 of Title 20 of the Official Code of Georgia
relating to the health of students in elementary and secondary education, so as to
require local school systems to conduct an annual fitness assessment and to comply with
such

More Legislation - 2009

SB 891

SECTION 2. Subchapter D, Chapter 25, Education Code, is
amended by adding Section 25.114 to read as follows:

25.114. STUDENT/TEACHER RATIOS IN PHYSICAL EDUCATION

CLASS. In prescribing the curriculum for physical education
under Section 28.002(a)(2)(C), the State Board of Education shall
require that physical education classes be taught, to the extent
practicable, student/teacher ratios that are small enough to enable
school districts to:

[1] carry out the purposes and requirements for the
physical education curriculum as provided under Section 28.002(d);
More Legislation - 2009

HB 229

SECTION 1.

Part 5 of Article 16 of Chapter 2 of Title 20 of the Official Code of Georgia Annotated, relating to the health of students in elementary and secondary education, is amended by adding a new Code section to read as follows:

"20-2-706. Beginning in the 2011-2012 school year, each local school system shall conduct an annual fitness assessment of all students enrolled in the State Board of Education's recommendations. These assessments shall be conducted by the local school system or approved contractors. Each local school system shall report the results of the fitness assessment to the Board of Education annually in a format developed by the Board of Education.

This act shall take effect upon approval by the Governor.

Students Get Involved

Students Get Involved

Ask Yourself

- Why?
  - Purpose
    - Individual
    - Survellance

- How?
  - Students
  - Teachers
    - Training

- Audiences?
  - Students
  - Parents
  - Administrators
  - Government
Expected Outcomes

• Reports
  – To whom?
  – For what?

• Changes?
  – Testing alone
  – Programs/Educational Experiences
    - AAHPERD's Physical Best
    - CATCH
    - SPARK
    - MSPAN

  "Throwing a test" out there is NO better than "throwing the ball" out there!

Conclusion

• Good stuff happens with testing
  – “What I test is important”
  – Communication
    - Students, Teachers, Administrators, Parents, Public, Health Professionals

• Bad stuff happens with testing
  – Expensive
  – Bad data
  – Time consuming
  – Impact

• Any DIRECT impact from testing?
• Bad data are useless
• Uses
  - Public Health perspective
  - Individual
  - Statewide/National surveillance

Physical fitness testing CAN be an agent for change and assessment is a KEY element to a quality physical education program.
So -- do you want to do this?

YES!!!!!!!

Think, reason, and plan!

MORE!
MORE!
MORE!

Otherwise……..

We will continue to have a BIG WAIST...and
We will continue to have a BIG WASTE.

The End

Thank you!