Using Systematic Observation to Research School Physical Education and Physical Activity Programs

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Active Living Research

Webinar Goals

➢ Discuss relevance of DO in assessing PA and its contexts in schools

➢ Highlight DO research considerations

➢ Review two DO systems widely-used in schools (SOFIT and SOPLAY)

Background

➢ Schools are important locations for PA

  ➢ Assessing PA at school is important

➢ Access to schools can be difficult

  ➢ Studies must be as unobtrusive as possible and produce data that is relevant to the school

    ➢ Program and environmental evaluation is valuable to schools

➢ Systematic Observation

  ➢ Provides data schools care about

  ➢ Is relatively unobtrusive
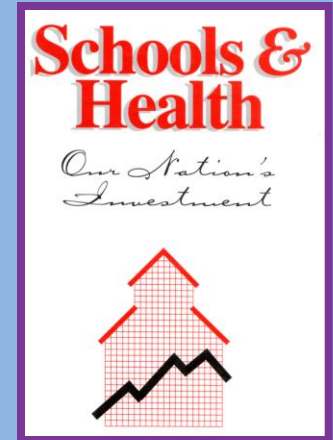
Systematic Observation

➤ Method for assessing observable behaviors in any context

   ➤ Assessing PA

➤ Simultaneous examination of behavior and physical and social environments

   ▪ location, presence of others, prompts, consequences

➤ SOFIT and SOPLAY are systematic observation instruments

   ➤ Assess PA in schools

Observation Techniques

- Frequency

- Duration (including latency)

- Time sampling/interval recording
  - Momentary time sampling
    - At specific moment only
  - Partial interval recording
    - Any time
  - Whole interval recording
    - Whole time

Systematic Observation

> ## **Advantages**
>> Direct and objective measure
>> Assesses contextual variables
>>> (e.g., social & physical environment)
>> Low participant burden
>> Suitable for aquatic environments
>> Results understood by practitioners

Systematic Observation

➤ **Disadvantages**

- Expense (observer time)

- Accessibility to all locations

- Potential subject reactivity

Feasibility of Systematic Observation

- Observer training required
  - Ranges from simple to complex
  - Depends upon complexity of system (number of activity and contextual codes)
- Time for measurement
  - Real time plus travel
  - Data entry
 - Recording and playback if video is used

Observer Training

➤ Memorize codes

➤ Directed practice using video segments

➤ Assessments using 'gold standard' video

➤ Field practice

➤ Field reliabilities with certified assessor

➤ Additional training to prevent observer drift

Video Observer Training Tools

➢ **Include**

  ➢ Definitions and examples for each variable

  ➢ Samples for practice coding

  ➢ Samples for initial observer assessment

  ➢ Samples for recalibration
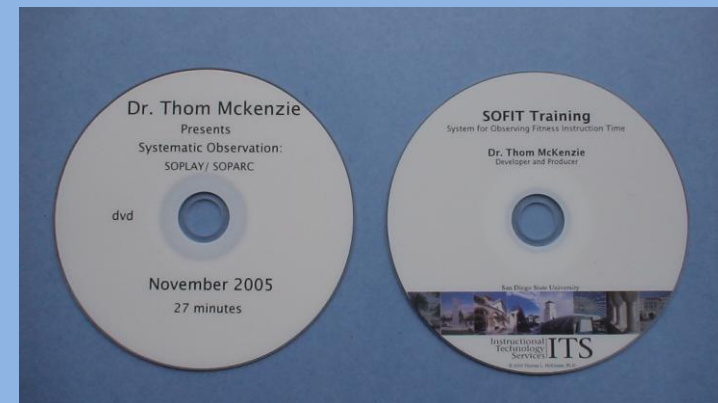
Using Video For Data Collection

- ➤ Some additional challenges
  - ➤ Human subjects considerations
  - ➤ Increased subject reactivity
  - ➤ Increased costs

Avoid mixing live and video data!

General Planning

➢ **IRB considerations**

    ➢ Individual students typically not identified

    ➢ Student assent & parent written consent usually not required

General Planning (2)

➢ How many observations are enough?
  ➢ The more the better
  ➢ Consider generalizability

➢ Adequacy of the sample (representativeness)
  ➢ Enough schools, lessons, teachers, students
  ➢ Diversity of subject matter
  ➢ Seasonality/day of week/time of day

Introduction to SOFIT and SOPLAY

- **System for Observing Fitness Instruction Time (SOFIT)**
  - PE Lessons
    - Student PA
    - Lesson Context
    - Teacher Behaviors

- **System for Observing Play and Leisure Activity in Youth (SOPLAY)**
  - School Environments
    - Use and PA

SOFIT and SOPLAY

THOM MCKENZIE

Observation Systems

➢ Designed for specific purpose
  ➢ (e.g., SOFIT, SOPLAY, SOPARC)

➢ Key ingredients
  ➢ Behavior categories
  ➢ Observation protocols (e.g., pacing)
  ➢ Coding conventions

➢ Use a validated system or create your own?
  ➢ Establishing validity (e.g., PA)
  ➢ Generality and comparison considerations

SOFIT Main Categories

- **Student Physical Activity**
  - Lying Down, Sitting, Standing, Walking, Vigorous

- **Lesson Context**
  - Management, Knowledge, Fitness, Skill Drills, Game Play, Other

- **Instructor Behavior**
  - Promotes PA (in class; outside)

Lesson Context

(How content is delivered or time is allocated--50% plus of students)

- Management
- Knowledge
- Fitness
- Skill Development
- Game Play
- Other (free play)

SOFIT Data Entry Form
Abbreviated

Int	Activity	Context	Teacher P
1	1 2 3 4 5	M K F S G O	I O N
2	1 2 3 4 5	M K F S G O	I O N
3	1 2 3 4 5	M K F S G O	I O N

Pacing Observations/Entering Data

➢ Duration (Computer; each key is toggle switch)

➢ Interval (10 sec observe/10 sec record)

  ➢ Computer (audio or video prompting)

  ➢ Audio cassette tape/CD/MP3/IPOD/smart phone

➢ Data entry

  ➢ Computer/apps

  ➢ Hand score

    ➢ Form

    ➢ Scantron
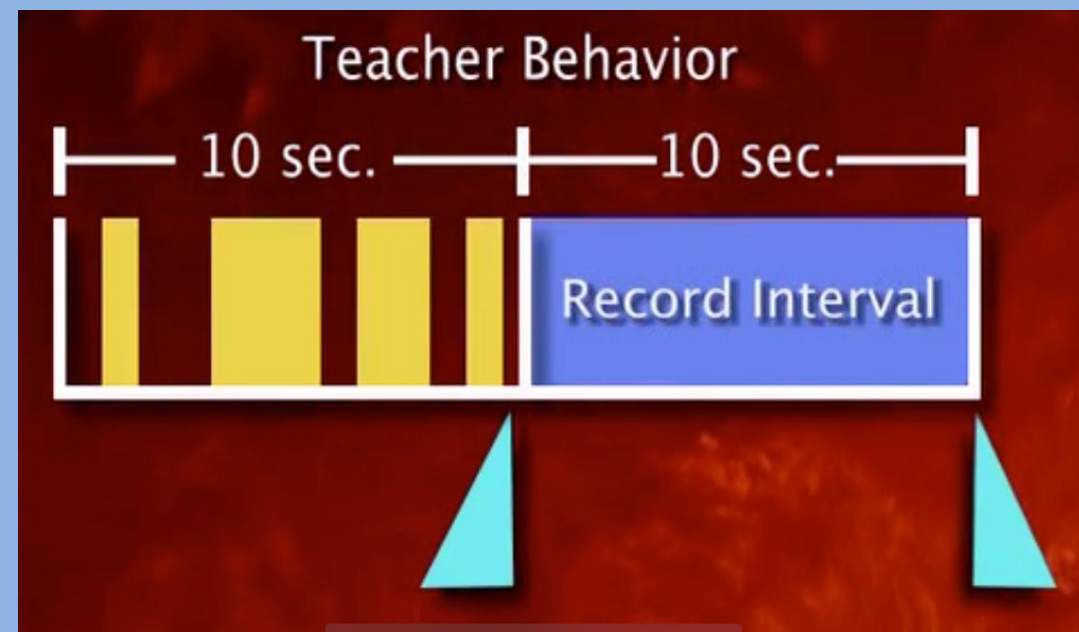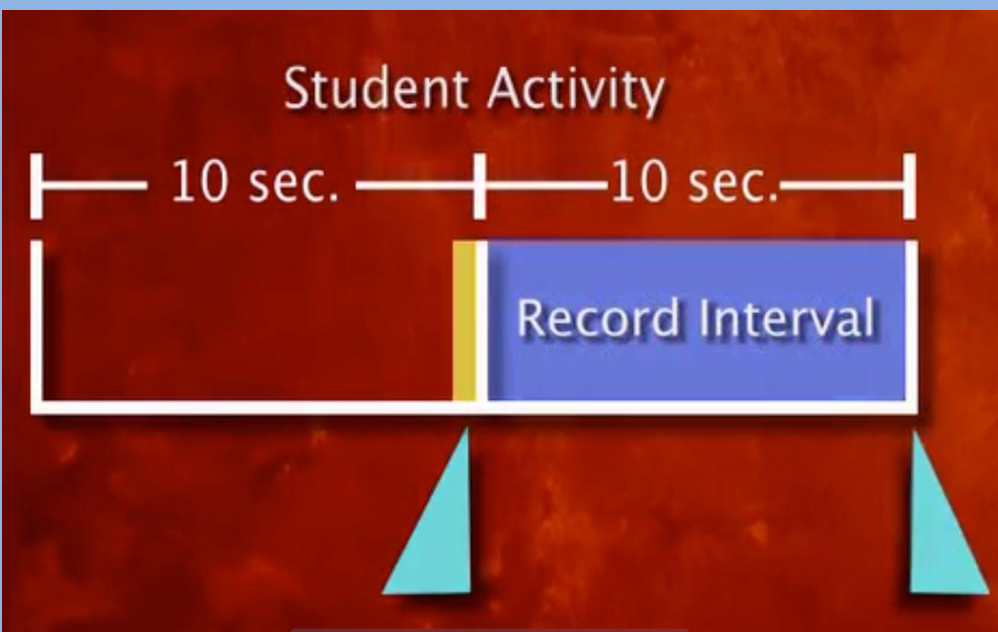
Physical Activity & **Lesson Context**
-decision made at
end of observe interval
-analysis by both min and %

MOMENTARY TIME
SAMPLING

Teacher Behavior
-decision based on behavior
any time during observe interval
-analysis by % of intervals only
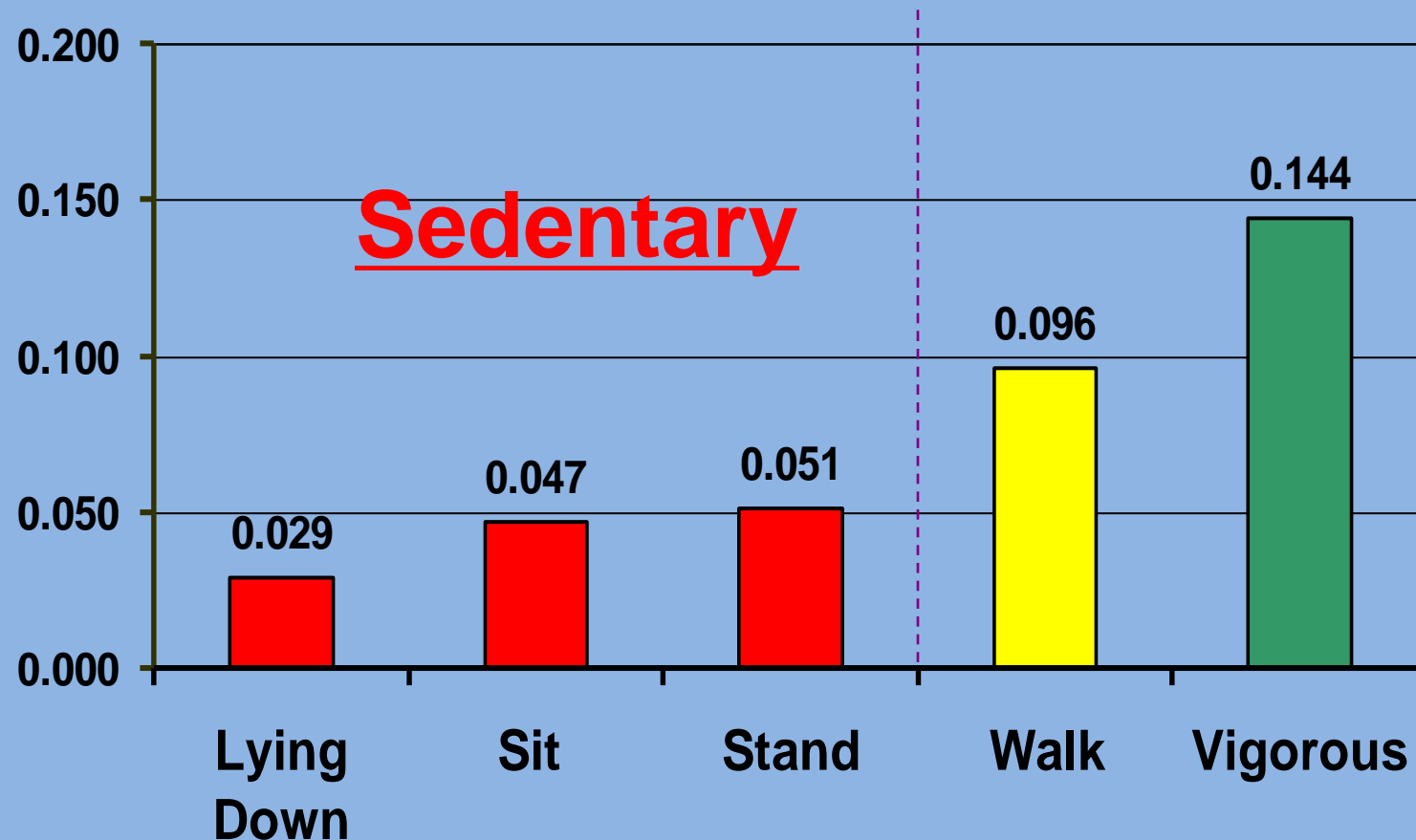
PARTIAL INTERVAL
RECORDING

Physical Activity Levels -Validation-

➢ SOFIT/SOPLAY Activity Codes

   ➢ heart rates (lab and field; ages 4-17)

   ➢ accelerometer (PE and recess)

   ➢ pedometer

Estimated Energy Expenditure

(McKenzie et al., JABA, 1991)

Estimated Energy Expenditure

(serves as summary score & variable of interest to public health)

- **EER = Energy Expenditure Rate (kcal/kg/min)**

  (PA intensity during a lesson)

  - = (% Lying Down x   0.029 kcal/kg/min)
  - + (% Sitting x   0.047 kcal/kg/min)
  - + (% Standing x   0.051 kcal/kg/min)
  - + (% Walking x   0.096 kcal/kg/min)
  - + (% Vigorous x   0.144 kcal/kg/min)

- **TEE = Total Energy Expenditure (kcal/kg)**

  (also includes lesson length)

  - TEE = EER multiplied by lesson minutes
  - (e.g., 0.100 kcal/kg x 30 min = 3 kcal/kg for lesson

Typical SOFIT Dependent Variables

Variable	Units	Sample
Lesson Length (actual)	**min**	**(34.3 min)**
Lying down	min, %	(00.2 min, 00.5%)
Sitting	min, %	(05.9 min, 17.2%)
Standing	min, %	(11.6 min, 33.9%)
Walking	min, %	(11.6 min, 33.9%)
Vigorous	min, %	(05.0 min, 14.6%)
MVPA (Walking + Vigorous)	**min, %**	**(16.5 min, 48.5%)**
EER (of lesson)	**kcal/kg/min**	**(0.077)**
TEE (EER x lesson minutes)	**kcal/kg**	**(2.64)**

(McKenzie et al., <u>RQES</u>, 2000, 430 MS lessons)

Typical Dependent Variables

• **Variable**	**Units**	**Sample**

- **Context (lesson = 34 minutes)**

• Management	min, %	(09.3 min, 27.2%)
• Knowledge	min, %	(2.0 min, 5.7%)
• Fitness	min, %	(08.4 min, 24.9%)
• Skill	min, %	(01.8 min, 5.4%)
• Game play	min, %	(10.0 min, 28.7%)
• Other (free play)	min, %	(02.7 min, 8.1%)

- **Teacher Behavior**

• In-class PA prompts	% intervals	(15.0%)
• Out-of-class PA prompts	% intervals	(00.5%)
• No PA prompts	% intervals	(84.5%

(McKenzie et al., RQES, 2000, 430 MS lessons)

Alternative Teacher Behavior Codes

Variable	Units
Promotes Fitness (P)	% intervals
Demonstrates Fitness (D)	% intervals
Instructs Generally (I)	% intervals
Manages (M)	% intervals
Observes (O)	% intervals
Other task (T)	% intervals

- **Teacher Behavior codes based on a hierarchy**
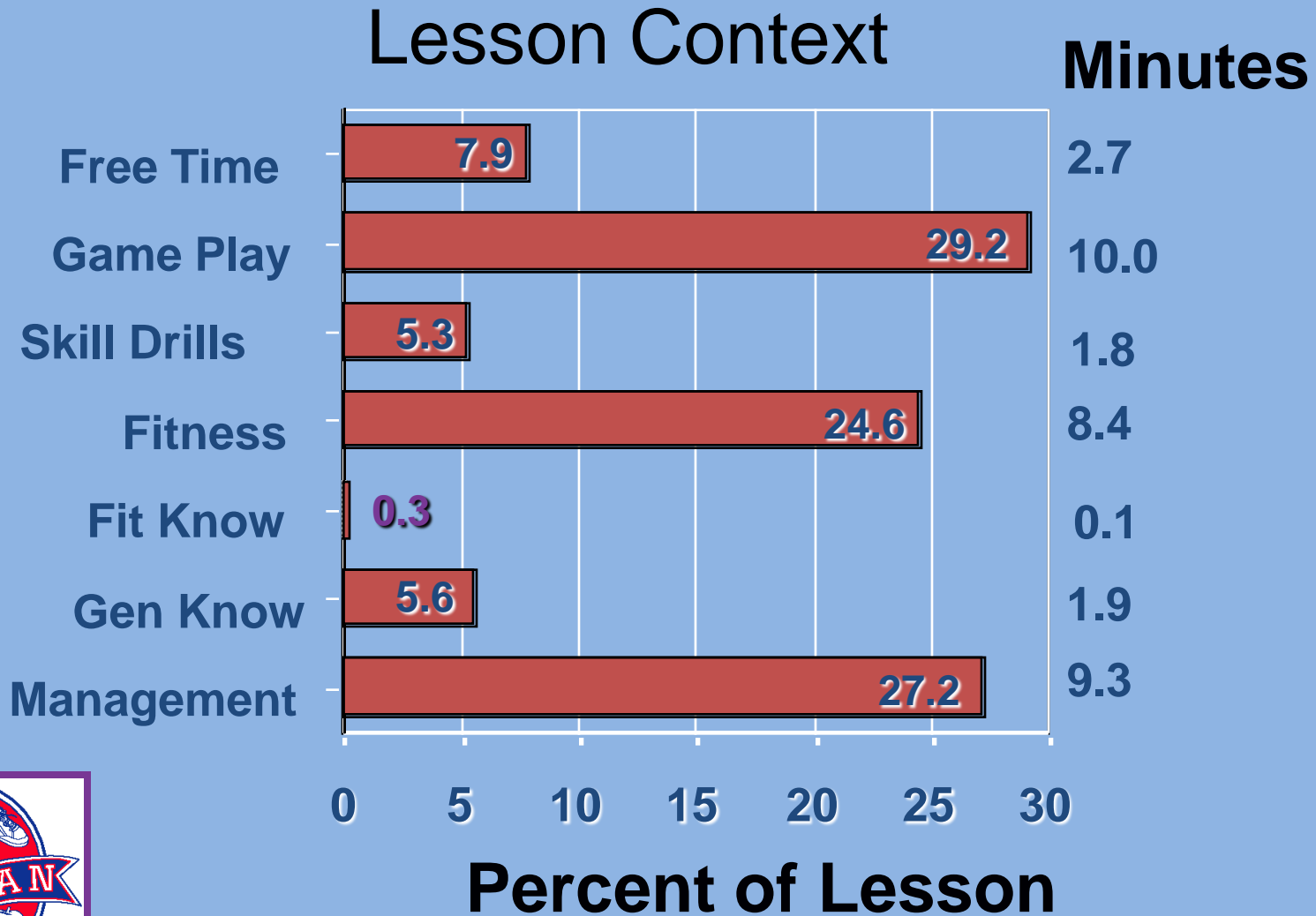
SOFIT Data Analysis

- **BASIC**
  - Use lesson summary scores (add columns)
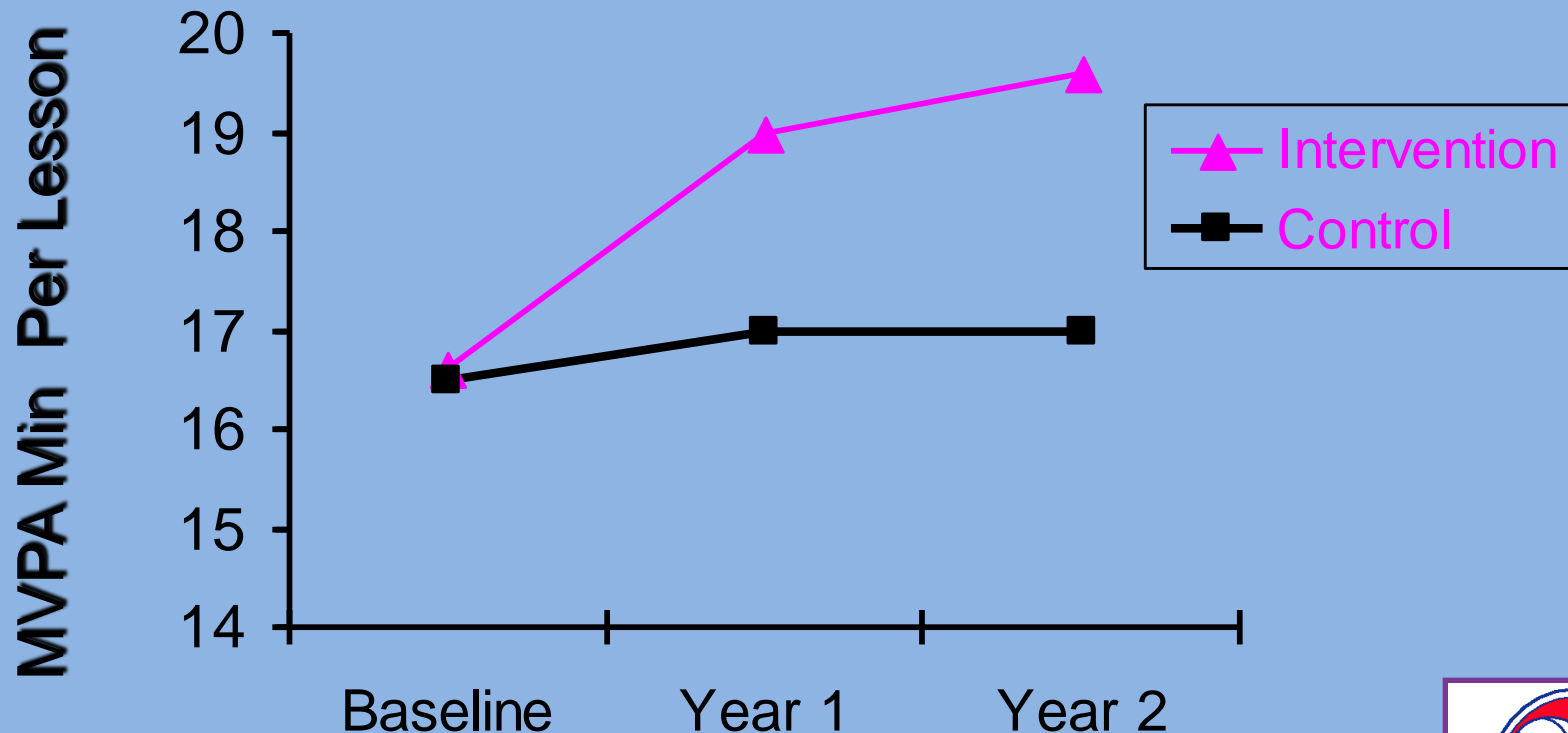
- **ADVANCED**
  - Enter interval by interval (assess by line)

Int	Activity	Context	Teacher P
1	1 2 3 4 5	M K F S G O	I O N
2	1 2 3 4 5	M K F S G O	I O N

Lesson summary scores permit assessing both minutes and % of PA and Lesson Context Variables:

Lesson Context

Minutes

Lesson Context	Percent of Lesson	Minutes
Free Time	7.9	2.7
Game Play	29.2	10.0
Skill Drills	5.3	1.8
Fitness	24.6	8.4
Fit Know	0.3	0.1
Gen Know	5.6	1.9
Management	27.2	9.3

0   5   10   15   20   25   30

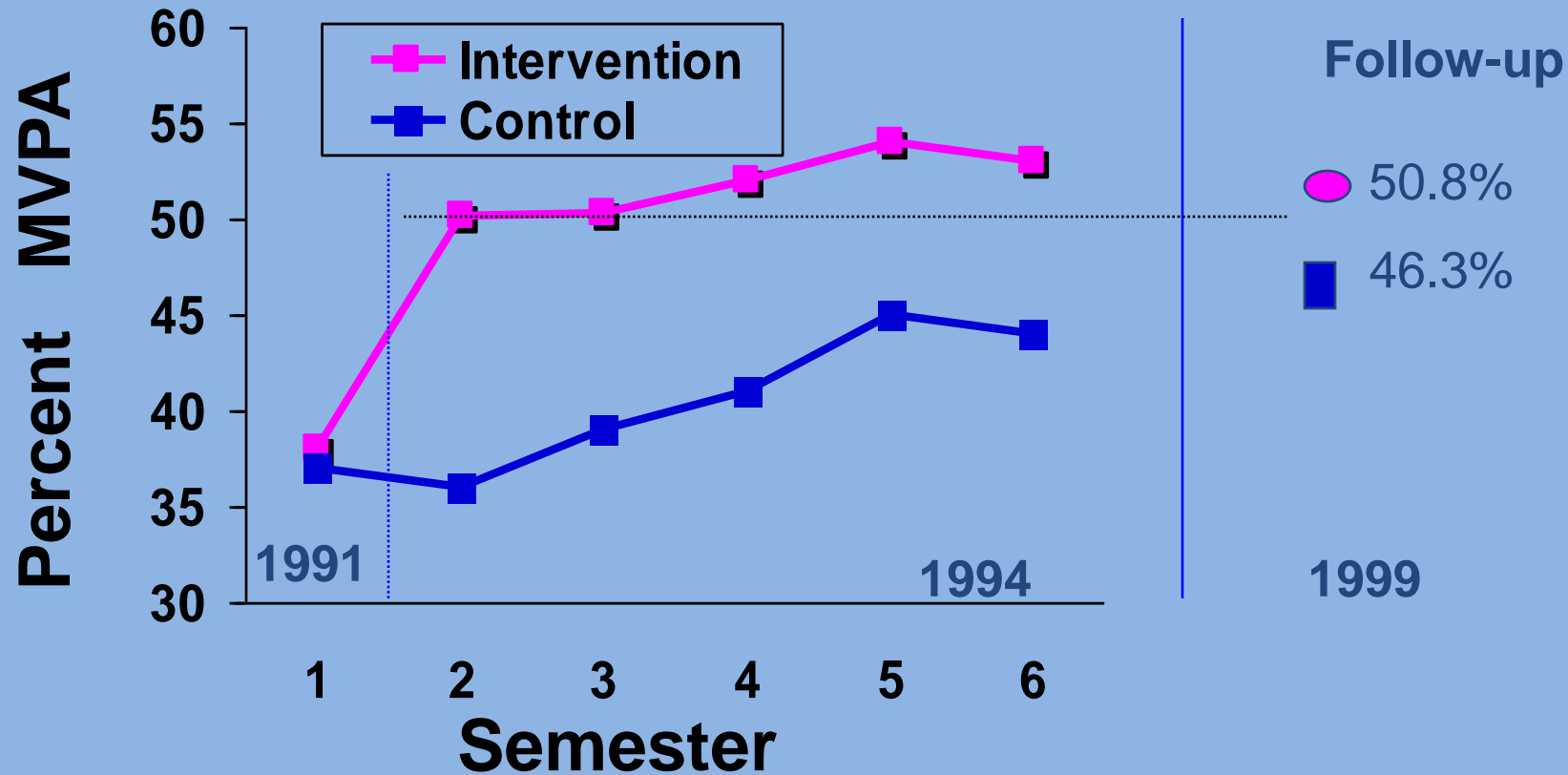**Percent of Lesson**

M SPAN

Lesson summary scores permit analyzing:
Effects of Interventions on MVPA Minutes

N=24 Schools; 214 Teachers; 1847 Lessons

Lesson summary scores permit assessing effects of a program using MVPA percent

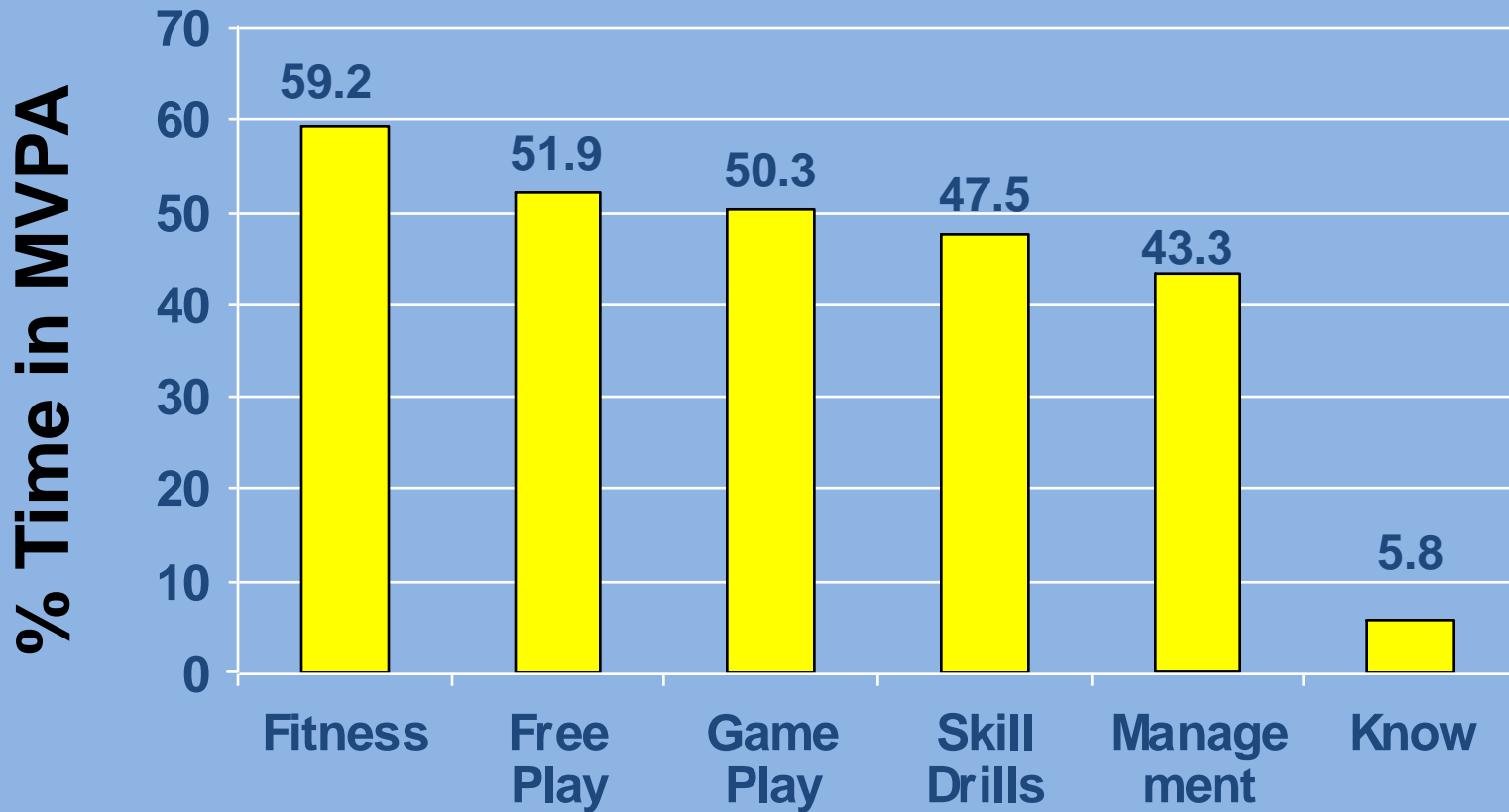(N=96 Elementary Schools; 2650 Lessons;
McKenzie et al., Prev Med, 1996; Health Ed & Beh, 2003)

Line by line data entry needed to assess interactions among PA and conditions

MVPA % by Lesson Context

Chart: % Time in MVPA by Lesson Context

- Fitness: 59.2
- Free Play: 51.9
- Game Play: 50.3
- Skill Drills: 47.5
- Management: 43.3
- Know: 5.8

(N=24 schools; 430 lessons; McKenzie et al., 2000, RQES)

Reliability of SOFIT Observations

➤ Observers simultaneously code same student

➤ Ideally: calculate interval-by-interval agreement

    ➤ Especially during training

    ➤ Assess all observers & all variables

    ➤ Start immediately; spread reliabilities over study

➤ Reporting in manuscripts

    ➤ For each level of analysis

    ➤ Some report only overall lesson scores

        ➤ Higher than I-I scores

Observing Places!

SOPLAY

If You Build It, Will They Come?

If They Come, Will They Be Active?

SOPLAY

➢ Target area score, not individual student score

➢ Observers scan designated target area and record activity intensity of each student

➢ Levels validated via heart rates enable energy expenditure in <u>area</u> to be estimated

➢ Simultaneous entries for relevant environmental characteristics

(McKenzie et al., 2000, <u>Preventive Medicine)</u>

SOPLAY/SOPARC Categories

- **Area User Characteristics**
  - **(Gender, Age, Race/Ethnicity)**
- **User Physical Activity Levels**
  - **(Sedentary, Walking, Vigorous)**
- **Primary Activity Modes**
  - **(e.g., soccer, dance)**
- **Area Contexts**
  - **(Accessible, Usable, Equipped, Supervised, Organized)**
- **Other Contexts**
  - **(Day, Time, Temperature)**

(McKenzie et al., 2006)

Mapping School Areas

➤ Print out satellite map (from Google)

➤ Walk around area, get a feel for it

➤ Identify the target areas

➤ Draw them and number them

McKenzie School-7 Activity Areas

AA 1

Activity Area 2

Arcade

AA 3 Gym

Activity Area 4

Food vending

Community Classrooms

AA 5 Pool

Library

AA 7 Weights

Activity Area 6

Parking

Bike storage
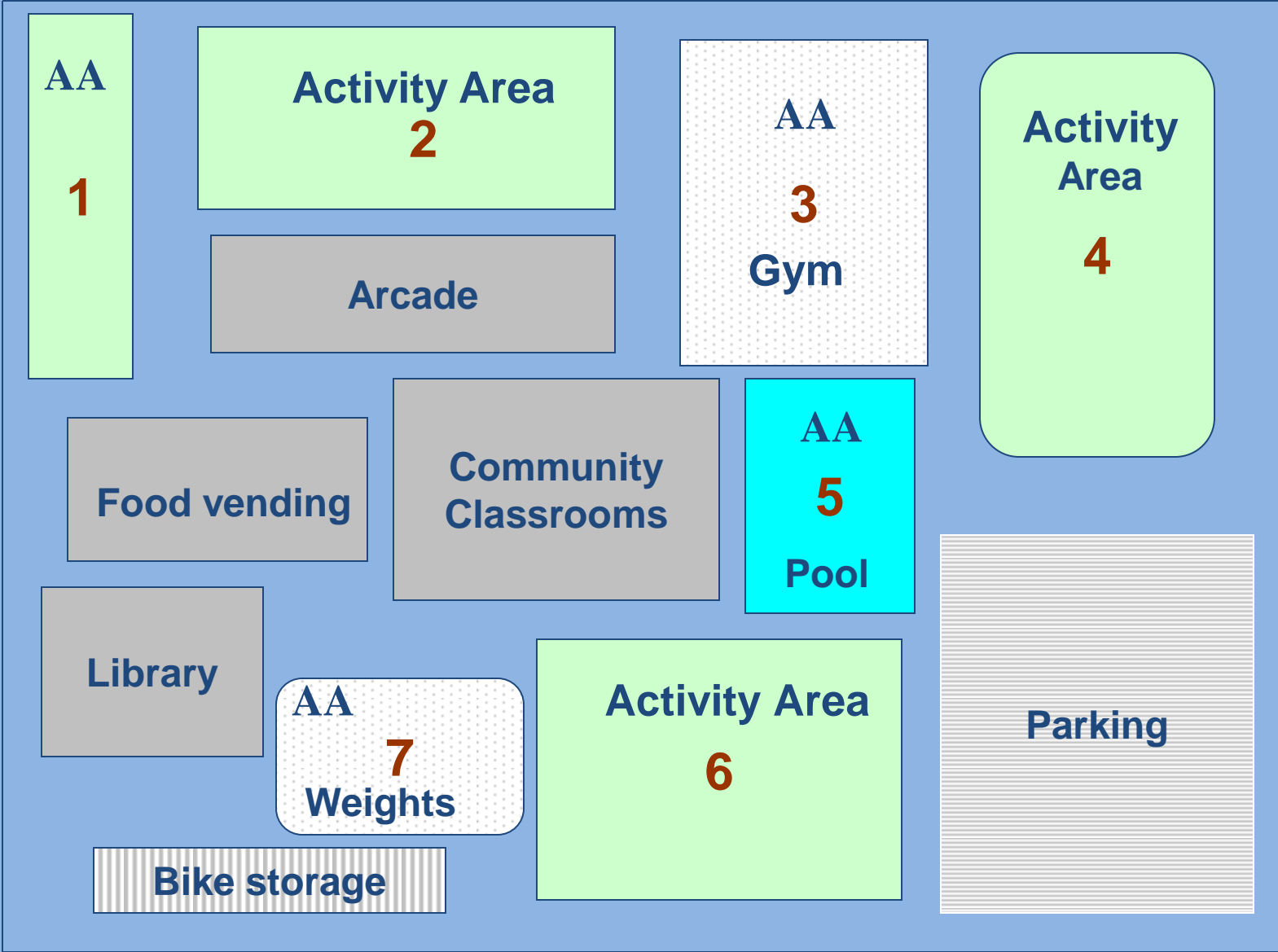
SOPLAY Board with Two Counters
-left for females; right for males

KEY COLORS
➢ red = sedentary (whoa)
➢ yellow = walking (slow)
➢ green = vigorous (go)

Figure 1. Abbreviated SOPLAY data recording form.

SOPLAY

## (System for Observing Play and Leisure Activity in Youth)

School ID: __ __   Date: __ __/__ __/__ __   Obs. ID #: __ __   Reliability: No Yes   Temp: __ __F   Period: BS LU AS

START TIME	AREA	CONDITION					GIRLS				BOYS			
		A	U	S	O	E	S	W	V	Act.	S	W	V	Act.
__ __:__ __	1	N Y	N Y	N Y	N Y	N Y	____	____	____	____	____	____	____	____
__ __:__ __	2	N Y	N Y	N Y	N Y	N Y	____	____	____	____	____	____	____	____

Form Codes: Temp.=Fahrenheit Temperature   BS=Before School   LU=Lunchtime   AS=After School   A=Accessible
U=Usable S=Supervised   O=Organized Activity   E=Equipment Provided   S=Sedentary   W=Walking   V=Very Active   Act.=Prominent Activity

Activity Codes: 0=No identifiable activity   1=Aerobics   2=Baseball/Softball   3=Basketball   4=Dance   5=Football   6=Gymnastics   7=Martial Arts
8=Racquet sports   9=Soccer   10=Swimming   11=Volleyball   12=Weight Training   13=Other playground games   14=None of the above

SOPLAY
Typical Dependent Variables

- **Variable**   **Units (1000 students)**

- Sedentary   #, %   (700, 70%)
- Walking/moderate   #, %   (200, 20%)
- Vigorous   #, %   (100, 10%)
- **MVPA (walking + vigorous)** #, %   **(300, 30%)**

- **SUMMARY SCORE USING MET VALUES**
   - **# Sedentary (700) x 1.5 METs plus**   (1050 METS)
   - **# Walking (200) x 3 METs plus**   (0600 METS)
   - **# Vigorous (100) x 6 METs**   (0600 METS)
                                                                     TOTAL = 2250
      METS

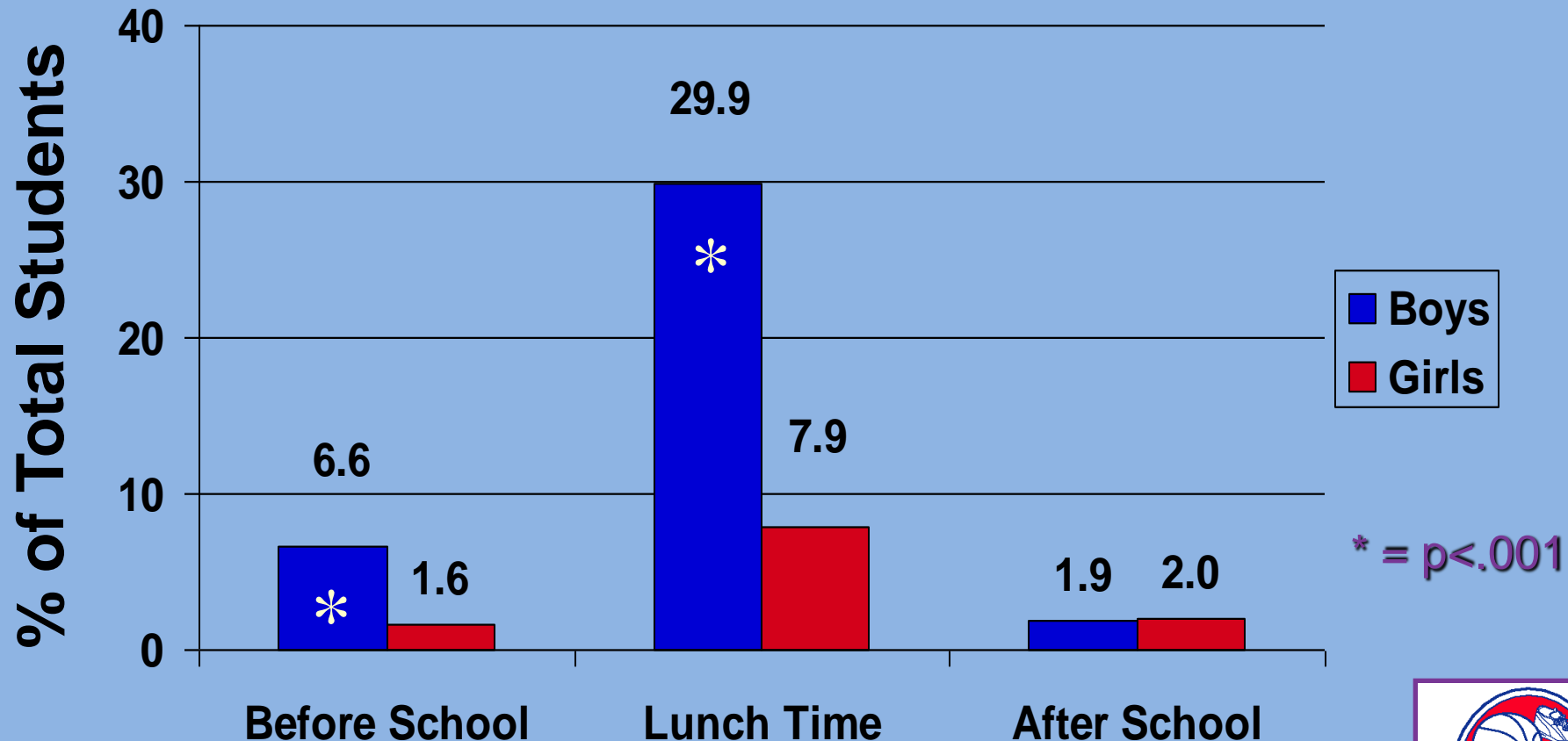# Percent of Total School Population in Activity Areas
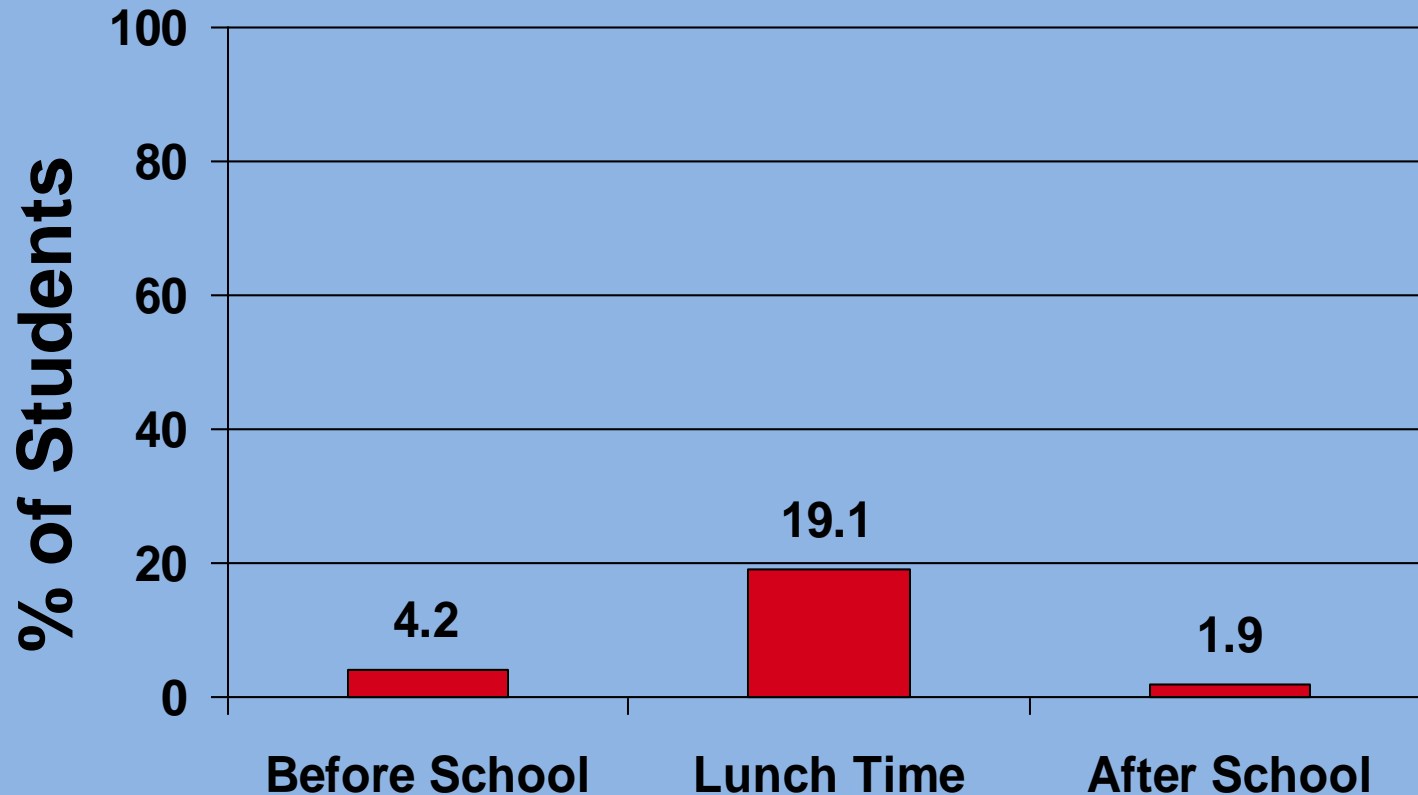
N=24 M-SPAN schools; 151 areas

(McKenzie et al., 2000, <u>Preventive Medicine)</u>

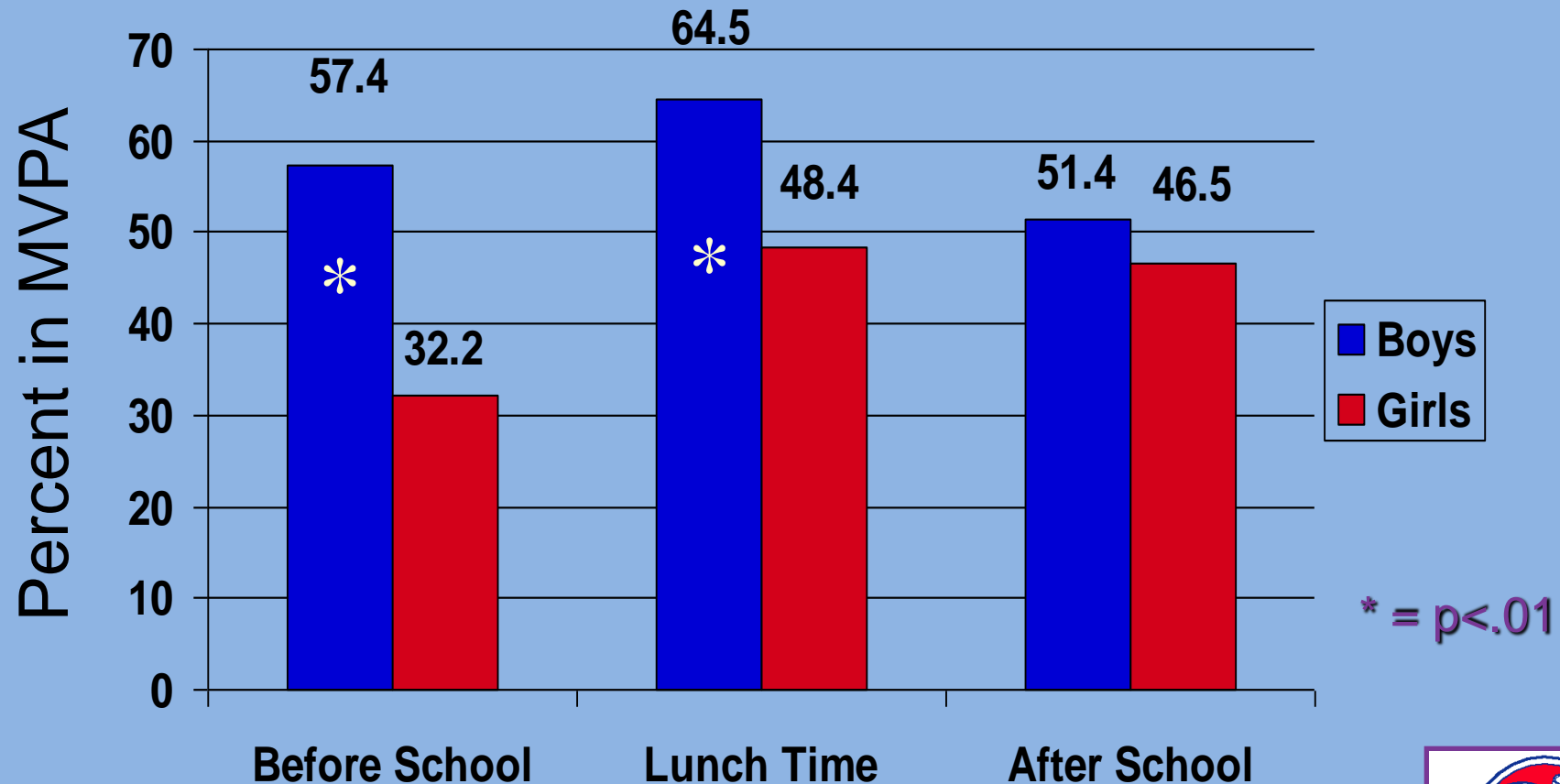# Percent of Total School Population in Activity Areas by Gender

N=24 M-SPAN schools; 151 areas

(McKenzie et al., 2000, Preventive Medicine)

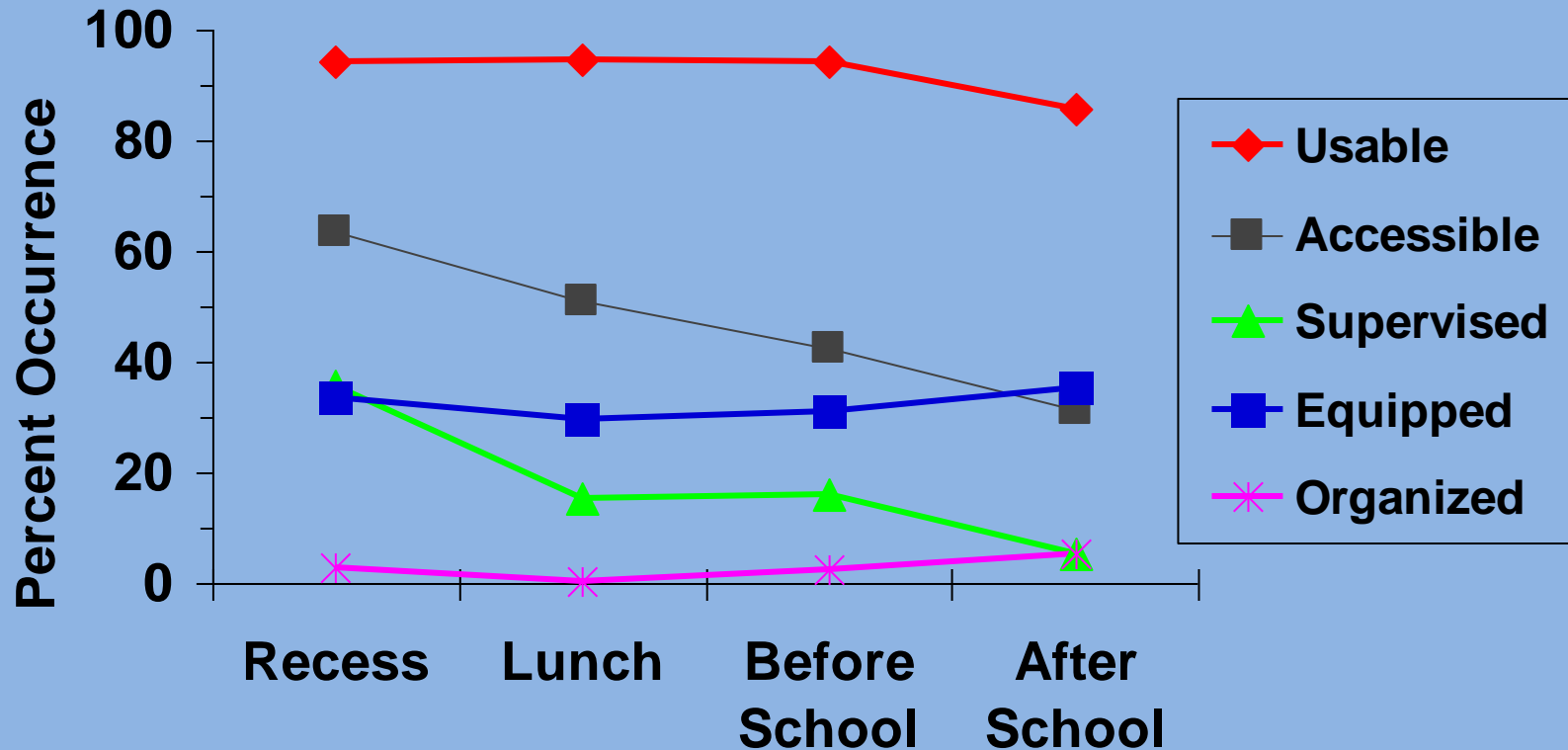Percent of Students in Observed Area in MVPA by Gender and Time Period

N=24 M-SPAN schools; 151 areas
(McKenzie et al., 2000, Preventive Med)

% = Observed incidences/total area visits

Area Contexts by Time Period

N=10 Hong Kong Schools; 65 Activity Areas
(Sit, McKenzie, et al., 2010, *HK Gov Report)*

Sample Reliability Measures

BACKGROUND

- Observer-pairs did 472 simultaneous measures in 125 activity areas

AREA CHARACTERISTICS

- Accessibility, 98%; Usability; 94%; Supervised, 97%, Organized, 97%; Equipped, 99%

NUMBER COUNT FOR AREA

- Correlation=.99 for both females and males
- % Agreement= 92% females, 89% males

ACTIVITY LEVELS (Overall)

- Females, 90%; Males, 88%

SUMMARY AND RESOURCES

MONICA LOUNSBERY

SOFIT

- **Assesses instructional lessons**
  - Time approximations for both PA levels and lesson contexts
    - Minutes and % of the lesson
  - Frequency of teacher behavior prompts
    - Rate (% of intervals)
  - Unit of analysis is usually the lesson
    - Across an individual teacher or multiple teachers
      - Can be used to examine
        - » aspects of teaching effectiveness
        - » generalities of the program
  - Can be used to assess individual children
    - Protocol modification is needed

SOPLAY

- **Assesses environmental use and PA**
  - Recess and before, during and after school programs
    - Characteristics of the space
    - People in the space
      - Number
      - Gender and other characteristics
      - Activity Levels
  - In broader school projects, PE environments might be included as part of the SOPLAY protocol
- **Can help schools adopt policies and practices to optimize school facilities and resources**

School Based PA

- What happens at school matters

- Need to know what goes on there

- Need to optimize PA in schools

- SOFIT and SOPLAY are great ways tools to help accomplish both

Observation Resources (FREE)

- **SOFIT and SOPLAY protocols**
  - On Active Living Research website

- **SOFIT and SOPLAY training videos**
  - North Carolina State University through ITUNES University link:

    http://itunes.apple.com/us/itunes-u/soplay-soparc-3-assessment/id529513043?i=115757894

- **App for SOPLAY**
  - iSOPARC for iPAD—from the App Store

ALR Systematic Observation

by Thom McKenzie

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1	SOPLAY SOPARC 1: Introduc...	🖥	--	5/22/12	Free	View In iTunes ▸
2	SOPLAY SOPARC 2: Practice	🖥	--	5/22/12	Free	View In iTunes ▸
3	SOPLAY SOPARC 3: Assess...	🖥	--	10/8/12	Free	View In iTunes ▸
4	SOFIT 1: Intro	🖥	--	5/22/12	Free	View In iTunes ▸
5	SOFIT 2: Coding Practice Wi...	🖥	--	5/22/12	Free	View In iTunes ▸
6	SOFIT 3: Coding Practice	🖥	--	5/22/12	Free	View In iTunes ▸
7	SOFIT 4: Assessment Lesso...	🖥	--	5/22/12	Free	View In iTunes ▸
8	SOFIT 4: Assessment Lesso...	🖥	--	5/22/12	Free	View In iTunes ▸
9	SOFIT 4: Assessment Lesso...	🖥	--	5/22/12	Free	View In iTunes ▸
10	SOFIT 4: Assessment Lesso...	🖥	--	5/22/12	Free	View In iTunes ▸
11	SOFIT Pacing		--	9/4/12	Free	View In iTunes ▸

11 Items

iSOPARC App for IPAD

Free on
App Store

Advantages of iSOPARC App

- **Digital Counter**
  - 3 different counter modes (includes speech)
  - automatically marks time and location of scans

- **Paperless data collection and storage**
  - no more paper, clock, pen, or mechanical counter
  - no need to transfer data to paper forms
  - re-uses repeated/common data from scan to scan

- **Consistent and Foolproof**
  - timestamp and GPS marked for each scan
  - photos for validation
  - area calculation

- **Easy export**

- **Faster development**

PA Observation Papers-General

- McKenzie, T. L., & van der Mars, H. (2015). Top 10 research questions related to assessing physical activity and its contexts using systematic observation. *RQES*, 86(1), 13-29.

- McKenzie, T. L. (2010). Seeing is believing: Observing physical activity and its contexts. *RQES*, 81(2), 113-122.

Selected SOPLAY/SOPARC Papers
Design and Statistics

- McKenzie, T. L., et al. (2000). Leisure-time physical activity in school environments: An observational study using SOPLAY. *Preventive Medicine, 30*, 70-77. (ORIGINAL paper)

- Sallis, J. F., et al. (2003). Environmental interventions for eating and physical activity: A randomized controlled trial in middle schools. *American Journal of Preventive Medicine*, 24, 209-217.

- Cohen, D. A., et al. (2011). How much observation is enough? Refining the administration of SOPARC. *Journal of Physical Activity and Health*, 8(8), 1117–1123.

Selected SOFIT Papers
Design and Statistics

- McKenzie, T. L., Sallis, & Nader, P. R. (1991). SOFIT: System for observing fitness instruction time. *JTPE, 11*, 195-205. (ORIGINAL paper)

- McKenzie, T. L., et al. (1996). School physical education: Effect of the Child and Adolescent Trial for Cardiovascular Health (CATCH). *Preventive Medicine*, 25, 423-431.

- McKenzie, T. L., et al. (2000). Student activity levels, lesson context, and teacher behavior during middle school physical education. *RQES*, 71, 249-259.

- McKenzie, T. L., et al. (2004). Evaluation of a 2-Year middle school physical education intervention: M-SPAN. *MSSE, 36*, 1382-1388.

Resources

Systematic Observation of Physical Activity in School Contexts
(T. McKenzie & M. Lounsbery, ALR Webinar, 5.20.15)

Physical Activity Observation Papers: General

McKenzie, T. L., & van der Mars, H. (2015). Top 10 research questions related to assessing physical activity and its contexts using systematic observation. *Research Quarterly for Exercise and Sport*, 86(1), 13-29.

McKenzie, T. L. (2010). Seeing is believing: Observing physical activity and its contexts. *Research Quarterly for Exercise and Sport*, 81(2), 113-122.

SOFIT and SOPLAY Protocols

SOFIT: System for Observing Fitness Instruction Time

SOPLAY: System for Observing Play and Leisure Activity in Youth

SOFIT and SOPLAY Training Videos (and SOFIT pacing audio file)

North Carolina State University through ITUNES University

Selected SOFIT Papers: Design and Statistics

McKenzie, T. L., Sallis, & Nader, P. R. (1991). SOFIT: System for observing fitness instruction time. *Journal of Teaching in Physical Education*, 11, 195-205. (ORIGINAL paper)

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McKenzie, T. L., Sallis, J. F., et al. (2004). Evaluation of a 2-Year middle school physical education intervention: M-SPAN. *Medicine and Science in Sport and Exercise*, 36, 1382-1388.

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Cohen, D. A., Setodji, C., et al. (2011). How much observation is enough? Refining the administration of SOPARC. *Journal of Physical Activity and Health*, 8(8), 1117–1123.

SOPLAY App

iSOPARC for iPAD—from the App Store

SOPLAY Counters

Counters are to be used for counting without taking eyes off people in target area. Typically they have red, yellow, and green keys (whoa, slow, go). A 'totalizer' is not needed. Sample source for counter purchase: http://www.denominatorcompany.com/