

Systematic Observation of Physical Activity and Its Contexts



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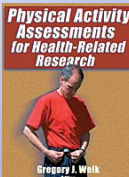
Overview

- Background
- Research Issues
- Practical Issues
- Examples:
 - Home, School, & Park environments

Peaceful Playgrounds

Systematic Observation

- Direct method for assessing physical activity
- Permits simultaneous examination of physical and social environment
 - (location, presence of others, prompts, consequences)
- History
 - (Bullen '54; Hovell '78)
- Method, not an instrument



Systematic Observation

- **Advantages**
 - Direct and objective measure
 - High internal validity
 - Assesses contextual variables
 - (e.g., social and physical environment)
 - Suitable for aquatic environments
 - Low participant (i.e., subject) burden
 - Results understood by practitioners

Systematic Observation

- **Disadvantages**
 - Expense (observer time)
 - Accessibility to all locations
 - Potential subject reactivity



Feasibility of Direct Observation

- **Training required**
 - 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'
- Field practice
- Field reliabilities with certified assessor
- Additional training to prevent observer drift

DVD Information

- **Content**
 - Definitions and examples
 - Samples with practice codes
 - Samples with code delays
 - Assessment videos
- **Availability**
 - E-mail request to ALR



Observation Techniques

- ◆ Frequency
- ◆ Duration (including latency)
- ◆ Time sampling/interval recording
 - ◆ Momentary time sampling—**SOPLAY & SOPARC**
 - ◆ Partial interval recording
 - ◆ Whole interval recording

Observation Systems

- **Designed for specific purpose**
 - (BEACHES, SOFIT, SOPLAY, SOPARC, SOCARP)
- **Key ingredients**
 - Behavior categories
 - Observation protocols (e.g., pacing)
 - Coding conventions

Observation Systems -Individual Behavior-

- **SOFIT**
 - PE and instructional classes
- **SOCARP**
 - Individuals on playgrounds
 - Includes group size, activity type, and social interactions
- **BEACHES**
 - Individual children at home and elsewhere

Interval Recording

- ◆ Typically short observe/record intervals
 - ◆ (6-10 seconds)
- ◆ Codes entered during 'record' intervals
- ◆ Activity codes vary among systems
 - ◆ 5 codes; BEACHES and CARS
 - ◆ 14 posture codes with 3 levels each (Bailey, '95)

Pacing Observations Entering Data

- **Duration** (Computer; each key is toggle switch)
- **Interval**
 - Computer
 - Audiotape tape/CD/MP3/IPOD
- **Data entry**
 - Computer
 - Hand score
 - Form
 - Scantron



Observation Systems -Areas and Facilities-

- **SOPLAY**
 - Group behavior at leisure at school
- **SOPARC**
 - Group behavior in parks and communities
 - Includes age and race/ethnicity groupings
- **SOPARNA**
 - Group behavior in wilderness areas
 - Includes group size, activity modes

Methodological Considerations (1)

- **Validity of codes**
- **Observer training**
- **Reliability measures**
- **Observer drift/instrument decay**
- **Recalibration**
 - "Gold-standard" videotapes

Methodological Considerations (2)

- **Sampling Adequacy**
 - Time periods (e.g., seasonality)
 - More than weather and temperature
 - Time of day
 - Week days vs. week ends
 - Enough teachers, students, parks

System Validation (1)

- **Activity codes:**
 - heart rates, VO2max, accelerometers
- **Example:**
 - SOFIT/SOPLAY Activity Codes
 - heart rates (lab and field; ages 4-17)
 - accelerometer (PE and recess)

Observer Variability

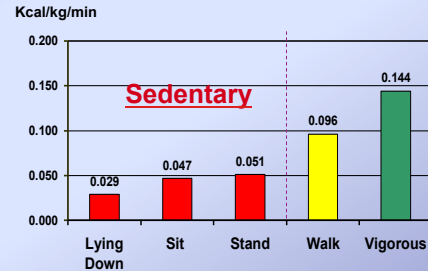
- **Within Observer**
 - Examined using video technology during training and recalibration
- **Between observers**
 - Called interobserver agreement or **reliability**
 - Reported in different ways:
 - Kappa (controls for chance agreement)
 - Interval by Interval (I-I)
 - Intraclass correlations



Physical Activity Data

- Typically summarized as:
 - Activity time in levels (minutes, hours)
 - Proportion of time (% of lesson or practice)
 - Estimated energy expenditure (kilocalories, METS)
 - Counts (e.g., steps taken)

Estimated Energy Expenditure



BEACHES Contexts (Newer version)

- 1. Activity Level
 - (lie down, sit, stand, walk, vigorous)
- 2. Physical Location
 - (e.g., inside home, outside)
- 3. People Present
 - (e.g., parents, sibling, others)
- 4. Behavior Motivated
 - PA; Sedentary
- 5. Motivator
 - (Adult; Child)
- 6. Views Media
 - (No; Yes)
- 7. Eats
 - (No; Yes)

RESULTS: Physical Activity at Home

- **OVERALL:** Children were
 - Indoors 78% of the time
 - Sedentary 74% of the time
 - Vigorous only 11% of time

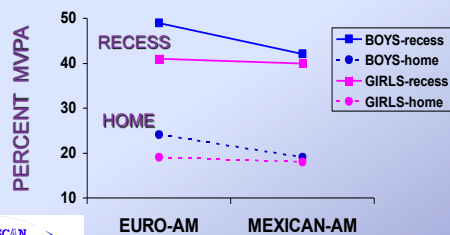
- **REDUCED ACTIVITY ASSOCIATED WITH:**
 - Being indoors ($p < .001$)
 - Parents being present ($p < .004$)
 - Time viewing media ($p < .001$)
 - Time ingesting food ($p < .05$)



Aventuras para Niños

McKenzie et al., 2008, *AJPH*

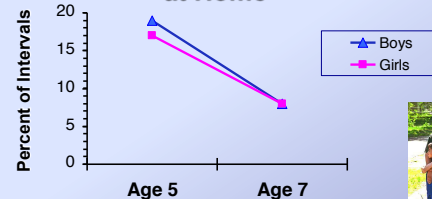
MVPA OF PRECHOOLERS AT RECESS AND HOME



EURO-AM MEXICAN-AM

(N= 351; McKenzie et al., 1992, *JBDT*)

Prompts for Physical Activity at Home



N=291 children; Elder et al., *JDPB*, 1998

*total verbal and physical prompts from adults and peers

School Settings

1. Physical Education
2. Recess/free play



“If Exercise is Medicine, PE is the Pill Not Taken”

Lack of regulation (policy, accountability)

- Dosage (frequency, duration, intensity)
- Prescriber (training)
- Content (appropriateness, sound)
- Delivery (palatable)



McKenzie & Lounsbury, *AJLM*, 2009

SOFIT Categories

➤ Physical Activity

- Lying Down, Sitting, Standing, Walking, Vigorous

➤ Lesson Context

- Management, Knowledge, Fitness, Skill Drills, Game Play, Other

➤ Instructor Behavior



SOFIT Entry Form Abbreviated

Int	Activity	Context	Interactions
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

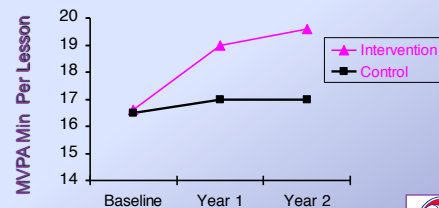
SOFIT Categories

➤ Lesson Context:

(How the lesson content is delivered)

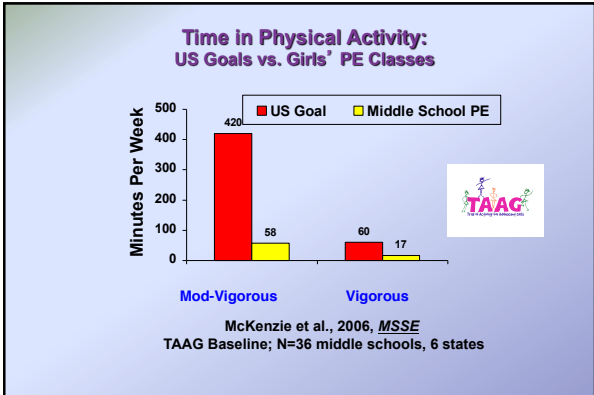
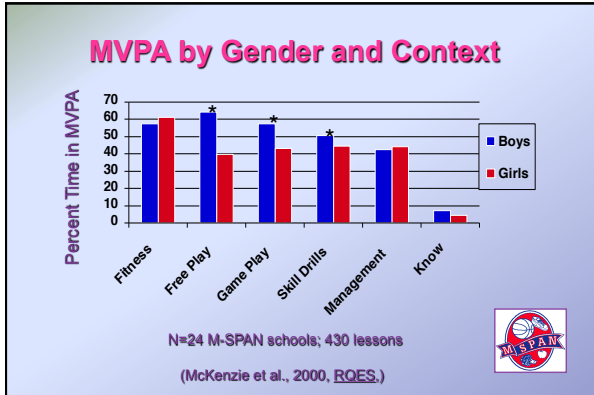
- Management
- Knowledge
- Fitness
- Skill Drills
- Game Play
- Free Play

M-SPAN PE: Effects on Student MVPA Minutes



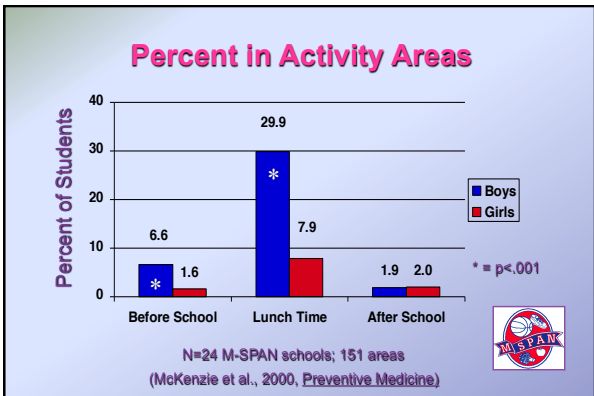
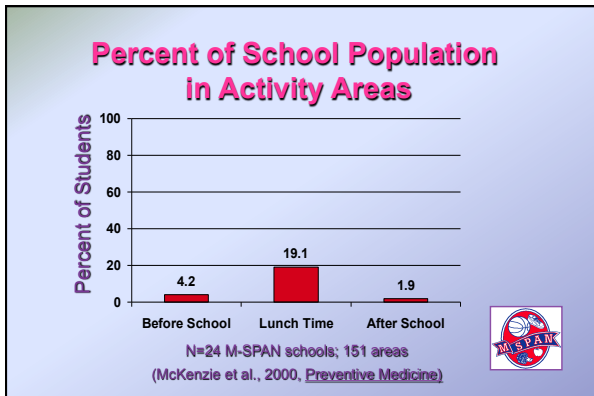
N=24 Schools; 214 Teachers; 1847 Lessons

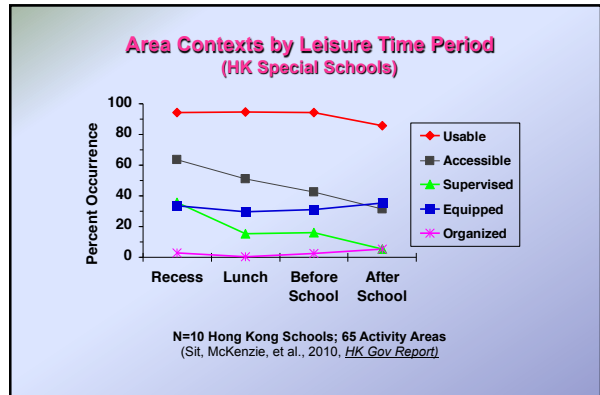
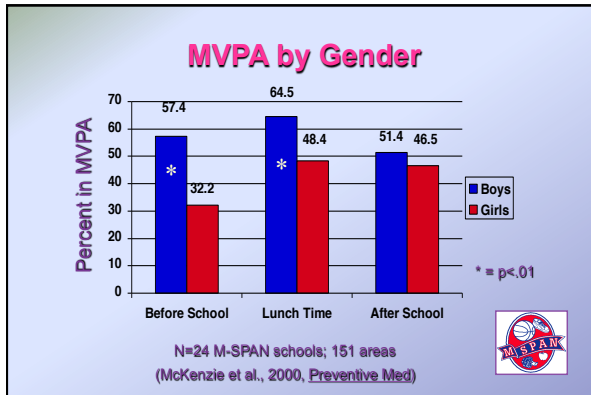




- ### SOPLAY Categories
- > Physical Activity
 - (Sedentary, Walking, Vigorous)
 - > Area Contexts
 - (Accessible, Usable, Equipped, Supervised, Organized)
 - > Other Contexts
 - (Time, Temperature, Predominant Activity/Sport)

- ### SOPLAY
- (McKenzie et al., 2000, *Preventive Medicine*)
- > Observers scan target areas and record activity intensity of each person
 - > Three levels: sedentary, walking, and vigorous
 - > Levels validated via heart rates enable energy expenditure in area to be estimated
 - > Simultaneous entries for relevant environmental characteristics





Community Settings

Parks and Recreation Centers

System for Observing Play and Recreation in Communities: SOPARC

T. McKenzie & D. Cohen
San Diego State University & RAND Corporation

- Developed in 2003
- Validated (2 NIH grants)
- Widely used (translated into four languages)
- Numerous published papers

Data Sources

- Direct Observation (SOPARC)
 - (System For Observing Play and Active Recreation in Communities)
 - N=16,224 park users
- Interviews of Park Users
 - N=713 adults
- Interviews of Area Residents
 - N=605 adults from randomly selected homes >2 miles
- US 2000 Census

Methods

- LOCATION
 - 8 neighborhoods in Los Angeles with:
 - High household poverty (\bar{X} =35%; range=16-55%)
 - High % of minority groups (2000 census)
 - Latino, range=16-55%
 - African-American, range =0-88%

Observation Methods

PARKS

- 8 parks in multi-ethnic communities
- Size: Range=3.4-16.0 acres; Mean = 7.8 acres
- 165 Target Areas: Range/park =17-27; Mean =20.6

DATA COLLECTION

- 8 assessors trained systematically
- 56 clement days (7 in each park)
- 4 one-hour periods/day (7:30AM; 11:30AM; 3:30PM; 6:30PM)
- 4511 area visits



RAND Health

SOPARC Categories

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

(McKenzie et al., 2006)

Reliability Measures

BACKGROUND

- Observer-pairs conducted 472 simultaneous measures in 125 activity areas in 6 parks

AREA CHARACTERISTICS

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

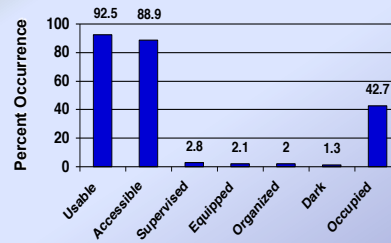
NUMBER COUNT FOR AREA

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

PEOPLE CHARACTERISTICS (Overall)

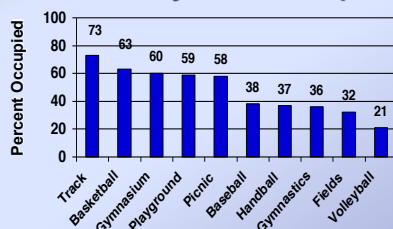
- Age Grouping: Females, 95%; Males, 97%
- Ethnic/Race Grouping: Females, 99%; Males, 99%
- Physical Activity Level: Females, 90%; Males, 88%

Characteristics of Activity Areas

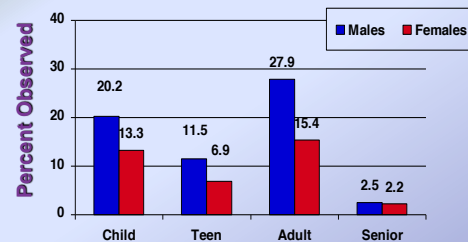


N=8 Parks; 165 Activity Areas; 4511 Visits

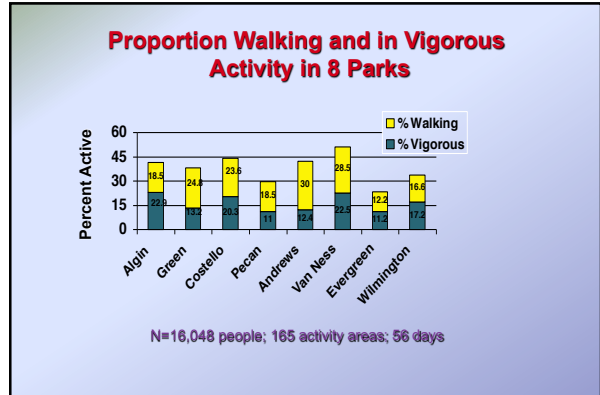
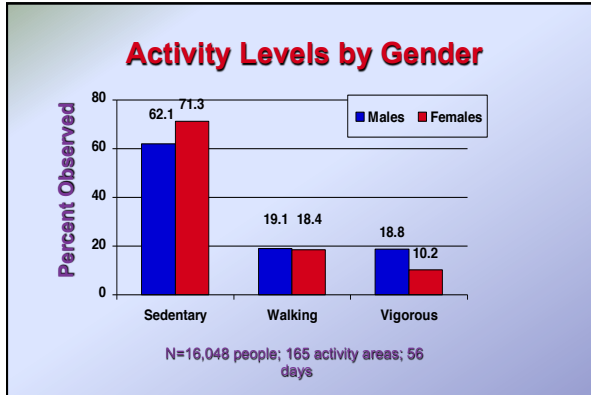
Proportion of Observations Activity Areas Occupied



Park Users: Gender and Age



N=16,244 people; 165 activity areas; 56 days



Preventive Medicine

Parks and physical activity: Why are some parks used more than others?

Deborah A. Cohen^{1*}, Terry Marsh², Stephanie Williamson³, Kathryn Piskin Denton⁴, Heesoo Matthers⁵, Claude Saville⁶, Thomas L. McKenzie^{7*}

¹North Carolina Central University, ²University of North Carolina, ³University of North Carolina, ⁴University of North Carolina, ⁵University of North Carolina, ⁶University of North Carolina, ⁷University of North Carolina

Health & Place

Impact and cost-effectiveness of family Fitness Zones: A natural experiment in urban public parks

Deborah A. Cohen^{1*}, Terry Marsh², Stephanie Williamson³, Daniela Gobetti⁴, Thomas L. McKenzie^{5*}

¹North Carolina Central University, ²University of North Carolina, ³University of North Carolina, ⁴University of North Carolina, ⁵University of North Carolina

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How Much Observation Is Enough? Refining the Administration of SOPARC

Deborah A. Cohen, Claude Satoji, Kelly R. Evenson, Phillip Ward, Sandra Lapham, Amy Hillier, and Thomas L. McKenzie

Background: The Systematic Observation of Play and Recreation in Communities (SOPARC) was designed to estimate the location and characteristics of people using neighborhood parks by recording them 4 times/week, 7 days/week. We tested whether this schedule was adequate and determined the minimum number of observations necessary to provide a robust estimate of park use characteristics and their physical activity levels.

Methods: We conducted observations every hour for 14 hours per day during 1 summer and 1 winter month in 10 urban neighborhood parks: 7 parks in Los Angeles, CA; 3 in Chicago, IL; 1 in Columbia, SC; 1 in Durham, NC; and 1 in Philadelphia, PA. We selected park users by gender, age group, apparent race/ethnicity, and activity level. We used a randomized Crossover's alpha and interclass correlation coefficients to test the reliability of using fewer observations. **Results:** We observed 76,632 individuals, an average of 163/park/day (range 125–202). Interrater reliability ranged from 0.80 to 0.99. Obtaining a robust estimate of park use characteristics and their physical activity required a schedule of 4 days/week, 4 times/week. **Conclusions:** An abbreviated schedule of SOPARC was sufficient for estimating park use, park use characteristics, and physical activity. Applying these observation methods can increase observed activity surveillance.

-4 times/day
-4 days (2 weekdays, Sat, & Sun)

Predicts park use, including:
Number, gender, PA levels, & age and race/ethnicity groupings