

## Systematic Observation of Physical Activity and Its Contexts



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## Overview

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

## Ecological Approach to Physical Activity Promotion

- Identifies times and places for PA
- Identifies social & physical resources/barriers
- Identifies policies that hinder/facilitate PA
- Modifies environmental factors to attract people and promote PA opportunities

(Sallis)

## What Questions Arise?

- Under what conditions are children most and least active and....
  - Where are they?
  - What are they doing?
  - Who is present?
  - Are there differences among demographic groups?
  - What PA supports or barriers are present?

## Systematic Observation

- Method for assessing behavior (PA)
- Simultaneous examination of behavior and physical and social environment
  - location, presence of others, prompts, consequences
- Method, not an instrument

## Systematic Observation

- **Advantages**
  - Direct and objective measure
  - Assesses contextual variables
    - (e.g., social and physical environment)
  - Suitable for aquatic environments
  - Low participant burden
  - 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/DVD Information

- **Content**
  - Definitions and examples
  - Samples with practice codes
  - Samples with code delays
  - Assessment videos
- **Availability**
  - YouTube & ITUNES U (North Carolina State)
  - [thomckenzie.com](http://thomckenzie.com)



## Observation Techniques

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



## Use of Video

- Needed for observer training and assessment
  - Include each variable; have diverse examples
- Challenges with video data collection
  - Human subjects considerations
  - Potential subject reactivity
  - Increased costs
  - Avoid mixing live and video data

## 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-

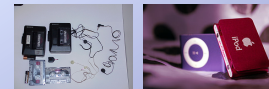
- **SOFIT**
  - PE and instructional classes
- **SOCARP**
  - Individuals on playgrounds
  - Includes group size, activity type, and social interactions
- **BEACHES**
  - Individual children at home and elsewhere

## 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)
    - pedometers

## System Validation (2)

- Additional validation
  - Momentary time sampling vs. duration recording
  - Interval length
  - Live vs. video records
  - Persons with delayed mental development or cerebral palsy
  - Ice hockey

## 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)

## Physical Activity Occurs within Specific Environments

- At home (play, work)
- Schools
  - PE Classes; Intramurals; Inter-scholastics;
  - Clubs; Free Play/Recess
- Recreation centers (structured, unstructured)
- Parks and trails
- In transport



# Home Settings



# Home Settings Have Changed!

## Increase in electronic media

- access to TVs, DVDs, smart phones
- number of channels, pay TV
- number child focused programs



# BEACHES Contexts (Newer version)

- 1. Activity Level
  - (lying 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)

# Home



Aventuras para Niños



# No Child Left Inside!

McKenzie et al. (2008). Environmental Correlates of Physical Activity in Mexican-American Children at Home (JPAH).

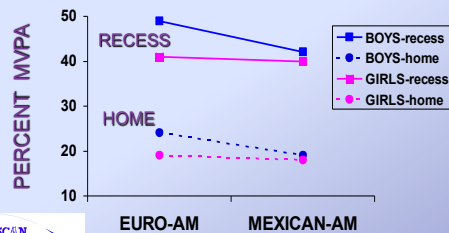
# RESULTS: Physical Activity at Home

- **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)



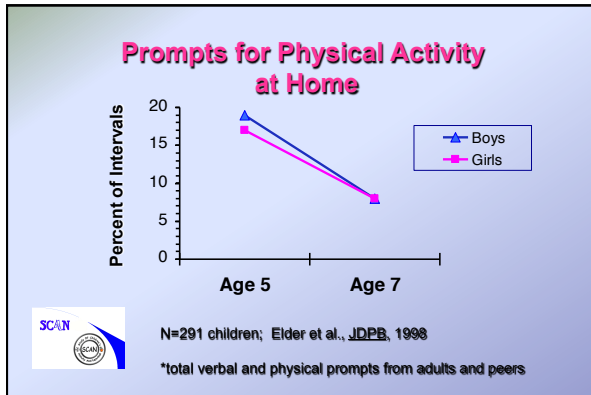
McKenzie et al., 2008, *AJPH*

# MVPA OF PRECHOOGLERS AT RECESS AND HOME



EURO-AM MEXICAN-AM

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



## School Settings

- Physical Education
- 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

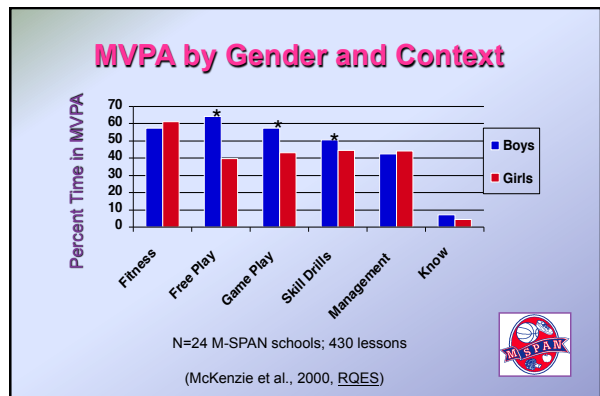
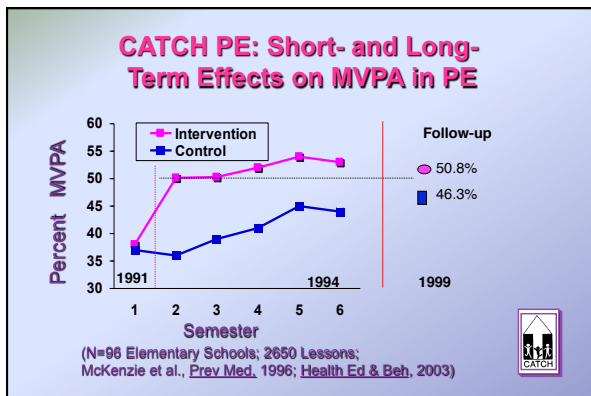
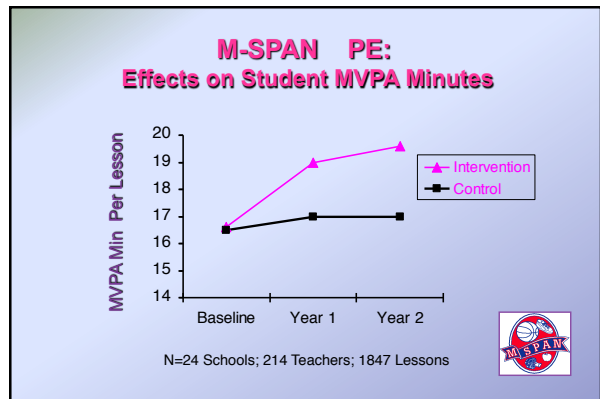
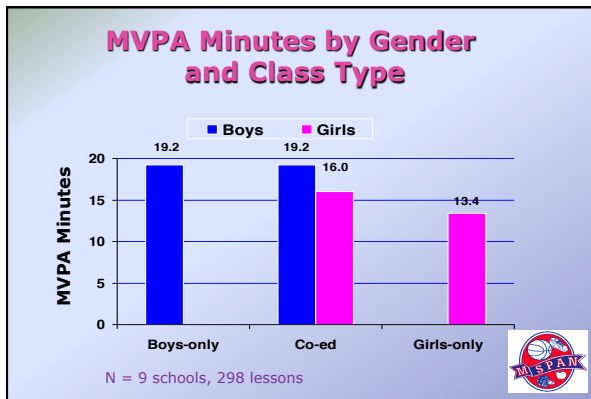
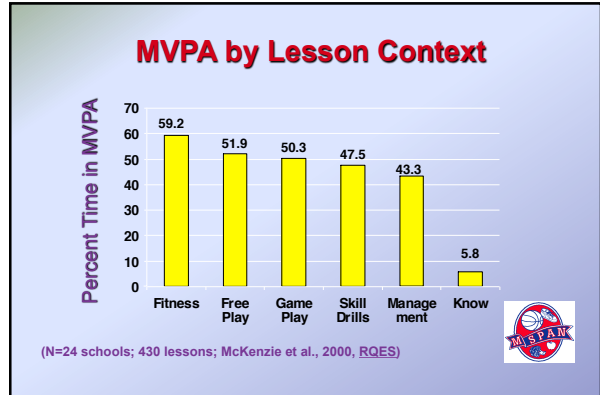
- **Physical Activity**
  - Lying Down, Sitting, Standing, Walking, Vigorous
- **Lesson Context**
  - Management, Knowledge, Fitness, Skill Drills, Game Play, Other
- **Instructor Behavior**

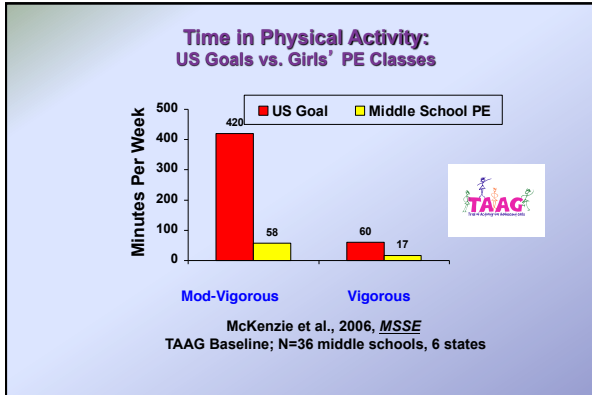
### SOFIT Entry Form Abbreviated

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





## If You Build It, Will They Come?

## If They Come, Will They Be Active?

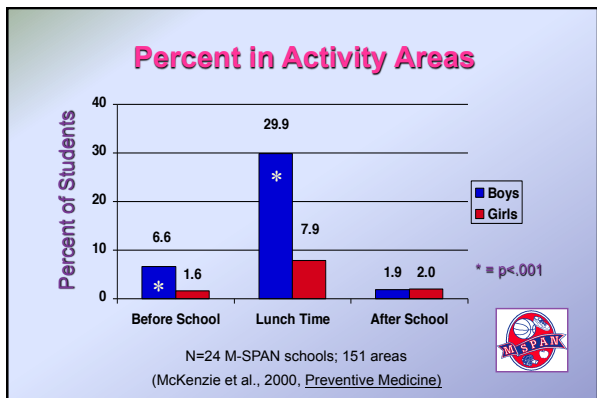
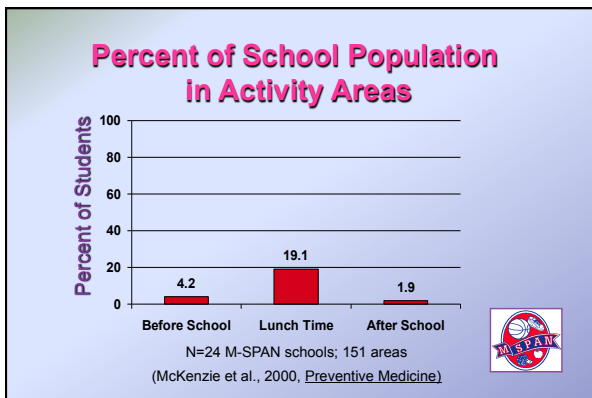
## SOPLAY Categories

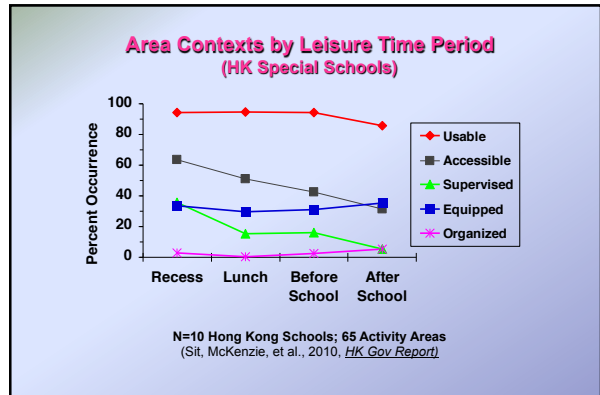
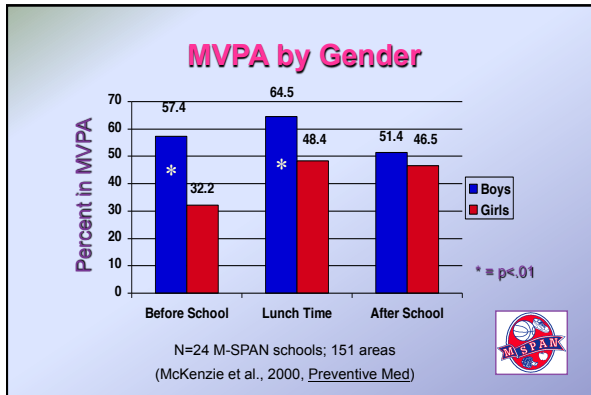
- **Physical Activity**
  - (Sedentary, Walking, Vigorous)
- **Area Contexts**
  - ( Accessible, Usable, Equipped, Supervised, Organized)
- **Other Contexts**
  - (Time, Temperature, Predominant Activity/Sport)

## 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

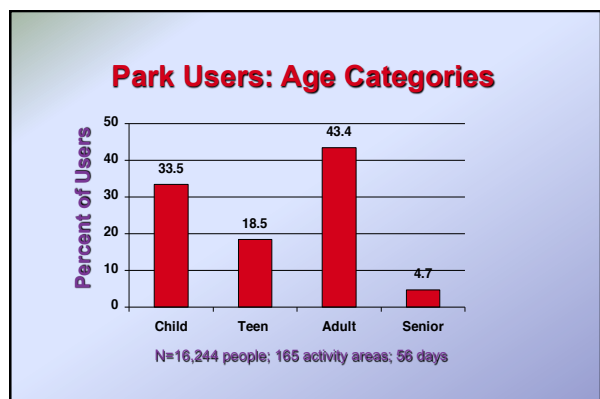
## System for Observing Play and Recreation in Communities: SOPARC

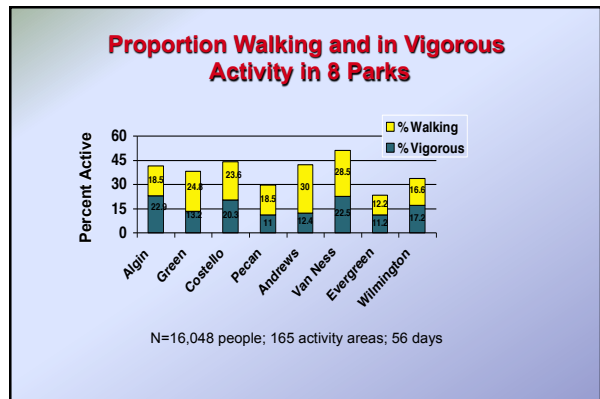
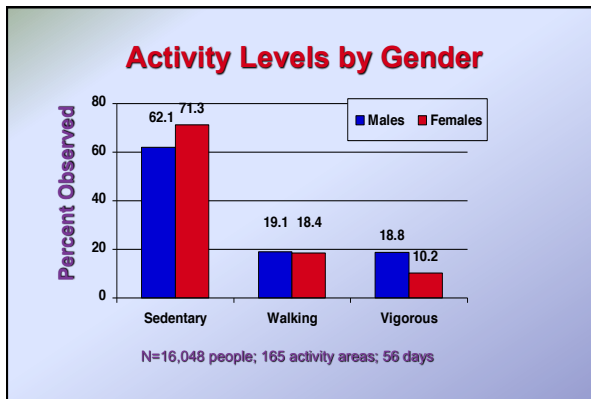
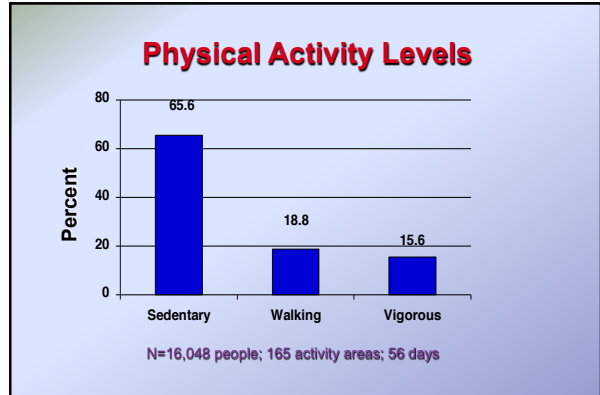
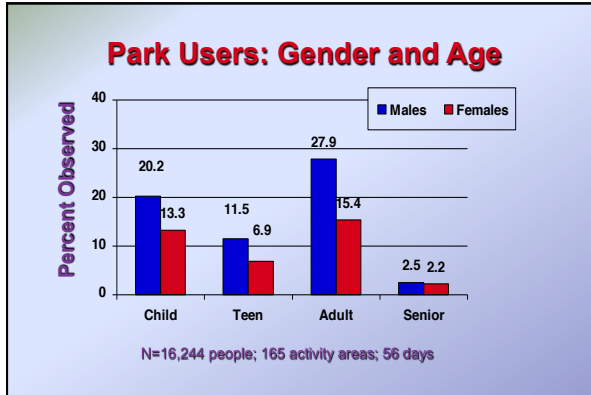
T. McKenzie & D. Cohen  
San Diego State University & RAND Corporation

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

## BACKGROUND

- Community parks rarely studied for PA
- Most relies on self-reports
- Little known about park area features and user characteristics
- Minority populations are at health risk, and their PA in parks is rarely studied





**Parks and physical activity: Why are some parks used more than others?**  
Deborah A. Cohen<sup>1\*</sup>, Terry Marsh<sup>2</sup>, Stephanie Williamson<sup>3</sup>, Kathryn Pihon Deane<sup>4</sup>, Dennis Muller<sup>5</sup>, Charles Sallis<sup>6</sup>, Thomas L. McKenzie<sup>7</sup>  
<sup>1</sup>University of California, San Diego; <sup>2</sup>University of California, Berkeley; <sup>3</sup>University of California, Los Angeles; <sup>4</sup>University of California, San Francisco; <sup>5</sup>University of California, San Diego; <sup>6</sup>University of California, San Diego; <sup>7</sup>University of California, San Diego

**Impact and cost-effectiveness of family Fitness Zones: A natural experiment in urban public parks**  
Deborah A. Cohen<sup>1\*</sup>, Terry Marsh<sup>2</sup>, Stephanie Williamson<sup>3</sup>, Daniela Goldberg<sup>4</sup>, Thomas L. McKenzie<sup>5</sup>  
<sup>1</sup>University of California, San Diego; <sup>2</sup>University of California, Berkeley; <sup>3</sup>University of California, Los Angeles; <sup>4</sup>University of California, San Francisco; <sup>5</sup>University of California, San Diego

**How Much Observation is Enough? Refining the Administration of SOPARC**  
Deborah A. Cohen, Claude Sallis, Kelly R. Evenson, Phillip Ward, Sandra Lapham, Amy Hillier, and Thomas L. McKenzie  
Observation of Play and Recreation in Communities (SOPARC) was designed to estimate of people using neighborhood parks by assessing their behavior and characteristics of park use. Observations were conducted in 8 parks in Los Angeles, CA, Albuquerque, NM, and San Francisco, CA. Each park was observed for 15 minutes per day and 10 alpha and beta observations were conducted. The SOPARC methodology, an assessment tool for use in parks, was refined to assess the number of days/week, if necessary. Can existing park use, park use characteristics, and other physical activity surveillance...

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

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



## Observation Support Training Materials and Apps

- Observation Protocols (ALR website)
- SOPARC/SOPLAY/SOFIT observer training videos
  - (Downloadable from NC State, ITUNES U)
- SOPARC on-line data entry & summary (RAND)
- iSOPARC App for IPAD (Apple Store)

### SOPARC Data Collection Form

DATE \_\_\_\_\_ PARK ID # \_\_\_\_\_ OBSERVER ID # \_\_\_\_\_ PERIOD:  Morning  Lunch  Afternoon  Evening  
 TARGET AREA \_\_\_\_\_ START TIME \_\_\_\_\_  
 Target Area # \_\_\_\_\_ Subtarget Area # \_\_\_\_\_

**CONDITIONS OF TARGET AREA**

Accessible (i.e., not locked or rented to others)	<input type="checkbox"/> Yes <input type="checkbox"/> No	Dark (i.e., insufficient lighting)	<input type="checkbox"/> Yes <input type="checkbox"/> No
Supervised (i.e., park staff or coach present)	<input type="checkbox"/> Yes <input type="checkbox"/> No	Empty (i.e., scan area is empty)	<input type="checkbox"/> Yes <input type="checkbox"/> No
Challenged (i.e., removable balls available)	<input type="checkbox"/> Yes <input type="checkbox"/> No	Comments: _____	
Usable (i.e., is not excessively wet or windy)	<input type="checkbox"/> Yes <input type="checkbox"/> No		
Organized (i.e., team sporting event)	<input type="checkbox"/> Yes <input type="checkbox"/> No		

PEOPLE	ACTIVITY	AGE GROUP				ETHNICITY				ACTIVITY LEVEL			
		Child	Teen	Adult	Old	L	B	W	O	S	W	V	
Participants	Primary Activity												
Female													
Male													
Participants	Secondary Activity												
Female													
Male													
Spectators	Organized Activity												
Female													
Male													

SOPARC Data Collection Form, Revised 7/1/04

### 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**

### Observing PA and Its Contexts: Take Home Messages

- SOFIT/SOPLAY/SOPARC PA codes have been validated
  - if you modify them, additional validation is needed
- Create your own or modify current systems
  - Determine what you want to know
  - Prioritize—you cannot observe it all
  - Operationalize categories, validate them, test for reliability
  - Coding conventions increase reliability
- Observation techniques differ between systems, and depend upon the research question(s)

### Observing PA and Its Contexts: Frequently Asked Topics

- Frequency of Observations
- Reliability
- Generalizability
- Reactivity
- Unit of Analysis
- IRB considerations

### Observation Resources (FREE)

- SOFIT/SOPLAY/SOPARC/BEACHES protocols
  - On Active Living Research website
- SOFIT/SOPLAY/SOPARC training videos
  - North Carolina State University through ITUNES University link:  
<http://itunes.apple.com/us/itunes-u/soplay-soparc-3-assessment/id529513043?i=115767894>
  - Thomckenzie.com
- APPS
  - iSOPARC for iPad—from the App Store
  - RAND SOPARC (entry and analysis)  
[www.rand.org/health/surveys\\_tools/soparc.html](http://www.rand.org/health/surveys_tools/soparc.html)