Systematic Observation of Physical Activity and Its Contexts

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Overview

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

Physical Activity is Complex! Some Questions Arise

- Under what conditions are people most and least active and….
  - Where were they?
  - What were they doing?
  - Who was present?
  - Were there differences among demographic groups?
  - What PA supports or barriers were present?

Ecological Approach to Activity Promotion

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

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 Systematic Observation

- Observer 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

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

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**

DVD Information

- **Content**
  - Definitions and examples
  - Samples with practice codes
  - Samples with code delays
  - Assessment videos
- **Availability**
  - North Carolina State (via ITUNES U)
  - 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)
    - pedometers

System Validation (2)

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

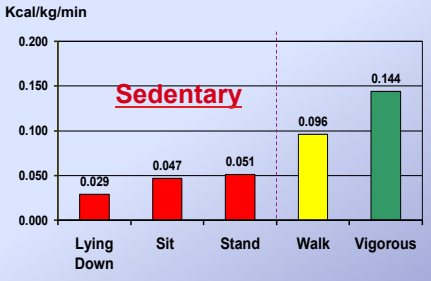
Observer Variability

- 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)

Estimated Energy Expenditure



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 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).

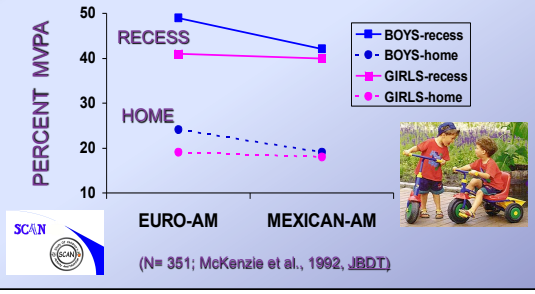
RESULTS: Physical Activity at Home

- **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*

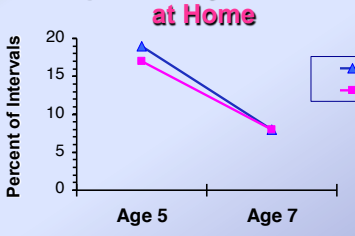
Aventuras para Niños

MVPA OF PRECHOOLERS AT RECESS AND HOME



(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 & Lounsbery, *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

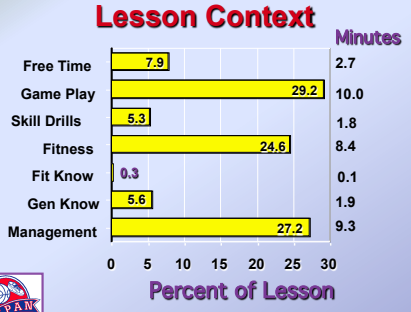
SOFIT Categories

- Lesson Context:

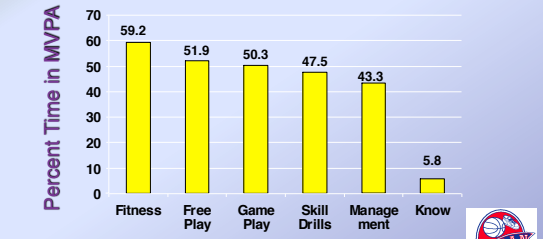
(How the lesson content is delivered)

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

Lesson Context

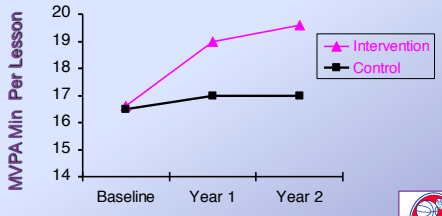


MVPA by Lesson Context



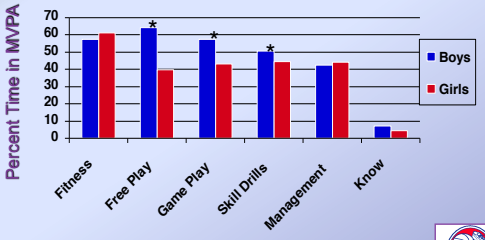
(N=24 schools; 430 lessons; McKenzie et al., 2000, RQES)

M-SPAN PE: Effects on Student MVPA Minutes



N=24 Schools; 214 Teachers; 1847 Lessons

MVPA by Gender and Context



N=24 M-SPAN schools; 430 lessons

(McKenzie et al., 2000, RQES.)

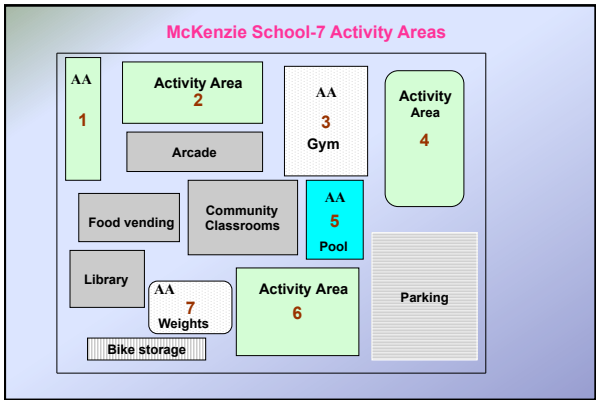
SOPLAY Categories

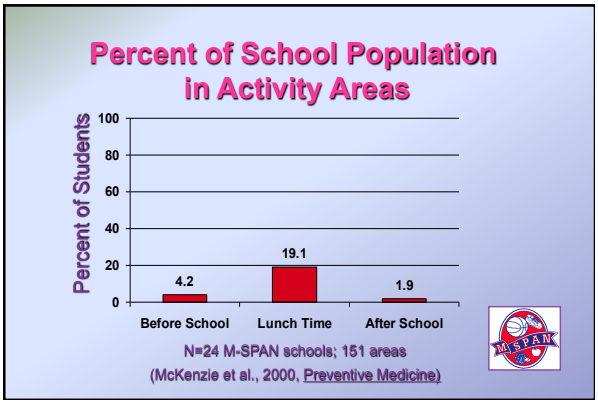
- Physical Activity
  - (Sedentary, Walking, Vigorous)
- Area Contexts
  - (Accessible, Usable, Equipped, Supervised, Organized)
- Other Contexts
  - (Time, Temperature, Predominant Activity/Sport)

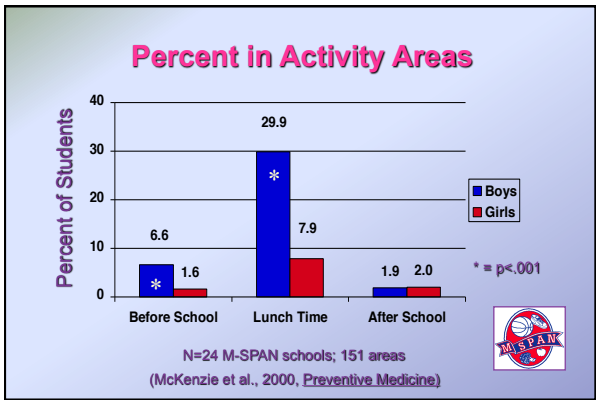
SOPLAY

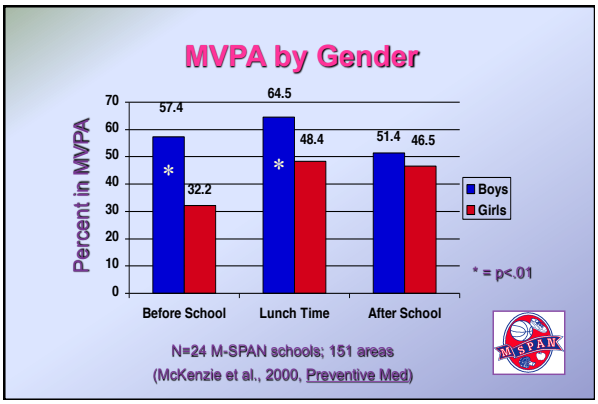
(McKenzie et al., 2000, Preventive Medicine)

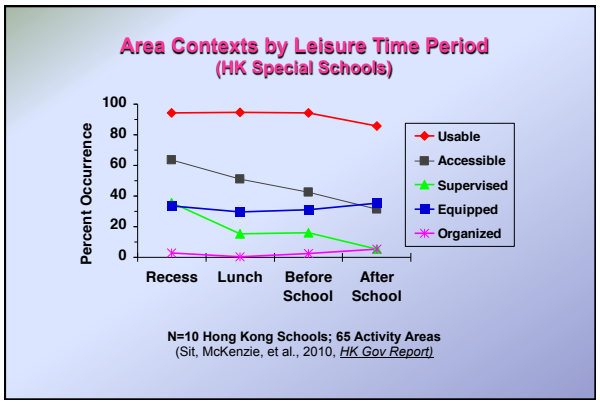
- Observers scan target areas and record activity intensity of each person
- Three levels: sedentary, walking, and vigorous
- Levels validated via heart rates enable energy expenditure in area to be estimated
- Simultaneous entries for relevant environmental characteristics


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


Percent of School Population in Activity Areas
Percent of Students
100
80
60
40
20
0
4.2
19.1
1.9
Before School
Lunch Time
After School
N=24 M-SPAN schools; 151 areas
(McKenzie et al., 2000, Preventive Medicine)


Percent in Activity Areas
Percent of Students
40
30
20
10
0
6.6
1.6
29.9
7.9
1.9
2.0
Boys
Girls
* = p<.001
Before School
Lunch Time
After School
N=24 M-SPAN schools; 151 areas
(McKenzie et al., 2000, Preventive Medicine)


MVPA by Gender
Percent in MVPA
70
60
50
40
30
20
10
0
57.4
32.2
64.5
48.4
51.4
46.5
Boys
Girls
* = p<.01
Before School
Lunch Time
After School
N=24 M-SPAN schools; 151 areas
(McKenzie et al., 2000, Preventive Med)


Area Contexts by Leisure Time Period
(HK Special Schools)
Percent Occurrence
100
80
60
40
20
0
Usable
Accessible
Supervised
Equipped
Organized
Recess
Lunch
Before School
After School
N=10 Hong Kong Schools; 65 Activity Areas
(Sit, McKenzie, et al., 2010, HK Gov Report)

System for Observing Play and Recreation in Communities: SOPARC
T. McKenzie & D. Cohen
San Diego State University & RAND Corporation
System for Observing Play and Recreation in Communities (SOPARC): Reliability and Feasibility Measures
Thomas L. McKenzie, Deborah A. Cohen, Amber Sehgal, Stephanie Williamson, and Daniela Golinelli
-Developed in 2003
-Validated (2 NIH grants)
-Widely used (translated into four languages)
-Numerous published papers

Mapping the Park

- Print out satellite map (from Google)
- Walk around the park, get a feel for it
- Identify the target areas
- Draw them
- See mapping guide for details

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

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%

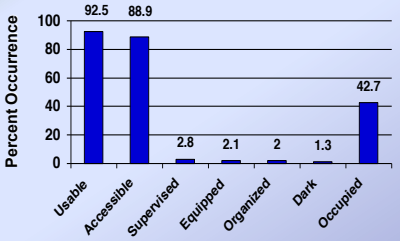
NUMBER COUNT FOR AREA

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

PEOPLE CHARACTERISTICS (Overall)

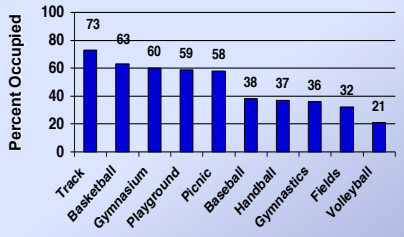
- Age Grouping: Females, 95%; Males, 97%
- Ethnic/Race Grouping: Females, 99%; Males, 99%
- Physical Activity Level: Females, 90%; Males, 88%

Characteristics of Activity Areas

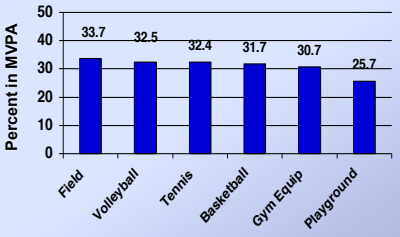


N=8 Parks; 165 Activity Areas; 4511 Visits

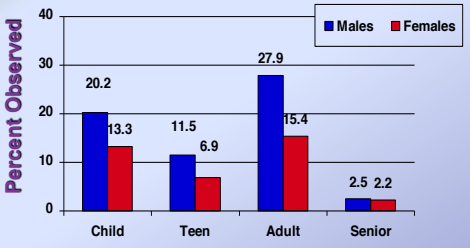
Proportion of Observations Activity Areas Occupied



Areas with Most VPA

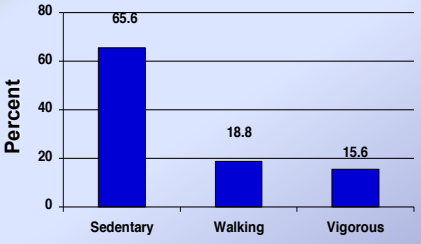


Park Users: Gender and Age



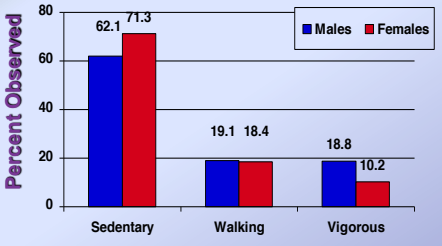
N=16,244 people; 165 activity areas; 56 days

Physical Activity Levels



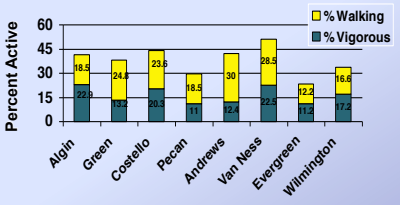
N=16,048 people; 165 activity areas; 56 days

Activity Levels by Gender



N=16,048 people; 165 activity areas; 56 days

Proportion Walking and in Vigorous Activity in 8 Parks



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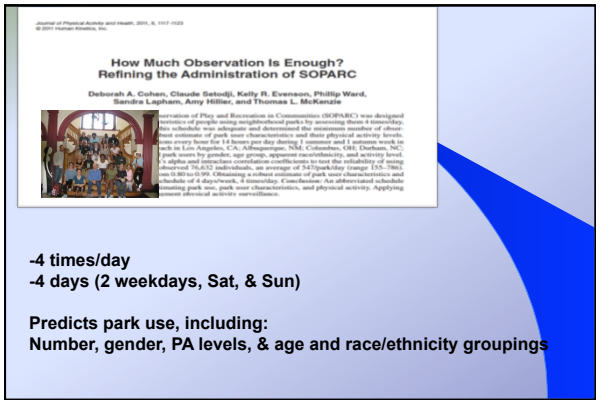

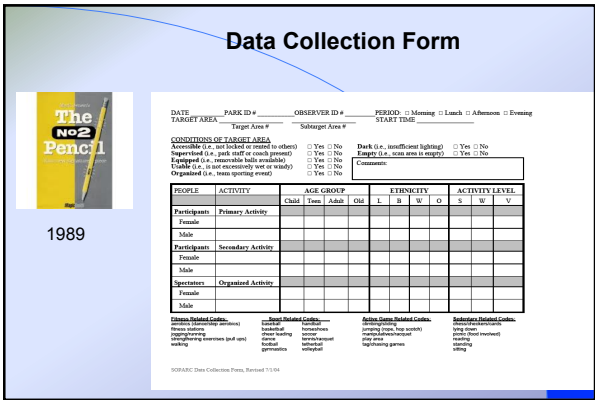

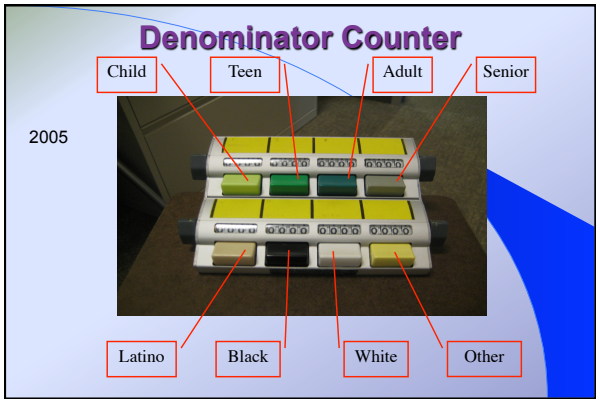

The OPEN Partnership: Observing Park Environments in Nevada (Lounsbery, PI)

- Increased emphasis on translational research and engaging practitioners
- It not only provides experiences for university personnel, but can make a difference in the lives of people
- OPEN provides an example of a collaborative effort (study concept & design and in-kind contributions)

Purpose

- PA studies not been conducted in Nevada parks
  - health impacts have not been translated into local government leisure services
- Overall purpose:
  - assess park users and characteristics
  - identify park characteristics associated with use and physical activity
  - examine resident profiles, perceptions, and use of park/trail environments

Study Locations

Park & Trail Selection

- City & County determined study parks and trails
  - 6 parks (4 county, 2 city) and 4 trails (3 county, 1 city)
- City & County determined target areas with University

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SOPARC

Staff Observer Training

- University personnel did training, reliabilities, and analyses
- Trained county and city staff (n=28) to use SOPARC
  - Staff assigned to collect data in specific parks
  - Training and data collection took place during staff hours

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Results & Discussion

- Most park users were adult and male
- People were mostly sedentary when observed
- Males were more active than females
- Few attendees in target areas with the most PA
- Few target areas organized or supervised
- Tremendous interest in data by parks/recreation leaders

Collaborative Investment

City of Las Vegas
321 staff hours for SOPARC training & data collection
-approximately $13,500 in staff time plus travel expenses

Clark County
750 staff hours for SOPARC training $ data collection
-approximately $31,500 in staff time plus travel expenses

UNLV PAPRP
$11,000 for equipment & part-time coordinator
-training, IOA data collection, & data analyses
- approximate value of $13,750 (.16 FTE; 40 hours RGA time)

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)

Observation Resources (FREE)

- SOFIT/SOPLAY/SOPARC/BEACHES protocols
  - On ALR 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=115757894
- APPS
  - iSOPARC for iPAD—from the App Store
  - RAND SOPARC (entry and analysis) www.rand.org/health/surveys_tools/soparc.html