Direct Observation of Physical Activity and Its Contexts

Seeing Is Believing, ALR 101

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Overview

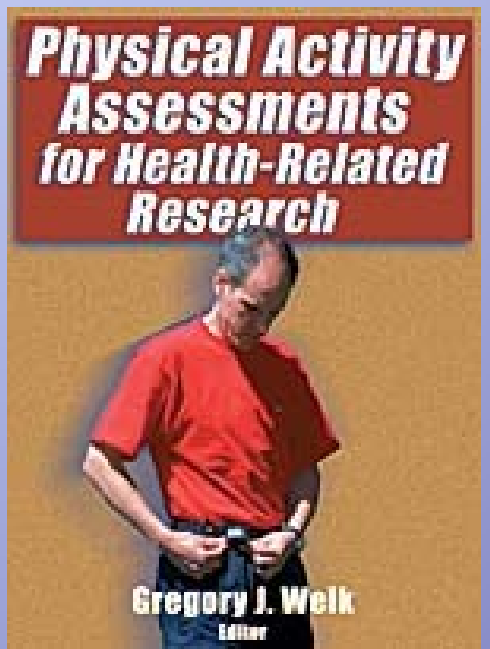
- Background
- Research Issues
- Practical Issues
- Examples: Micro environments

Physical Activity Measures

- Accelerometers
  - CALTRAC, CSA/Actigraph
- Self-reports
  - Interviews or questionnaires
  - (e.g., PAR, SAPAC)
- Proxy measures
  - (e.g., heart rate monitors; doubly labeled water)
- Direct observation
  - BEACHES, SOFIT, SOPLAY, SOPARC, SOCARP

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 Sources of Error

- **Reactivity**
- **Instrument Decay/Observer Drift**

  (Unintended changes in interpretation over time)

SPORTS, PLAY & ACTIVE

SPARK

RECREATION FOR KIDS!

CATCH

MSPAN

TAAG

Trial of Activity for Adolescent Girls

SCAN

Study Of Children's Activity And Nutrition

SCAN

NICHD Study of Early Child Care & Youth Development

MoVe

...TO BE ACTIVE... TO EAT WELL

me Muevo

...PARA SER ACTIVO... PARA COMER SALUDABLE

Aventuras para Niños

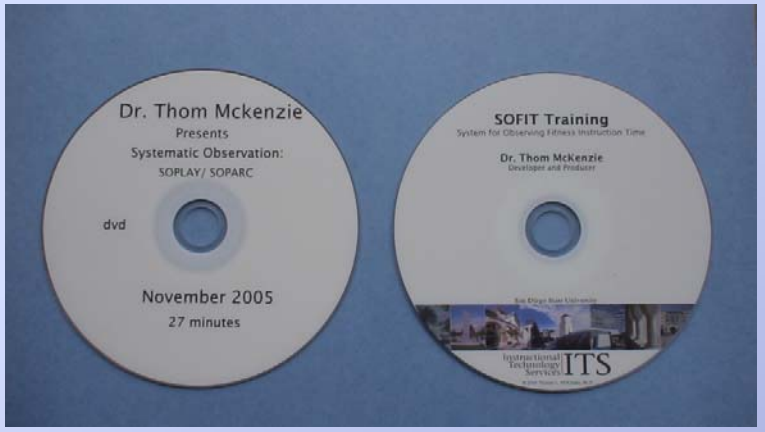
RAND Health

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



Observation Techniques

- Frequency
- Duration (including latency)
- Time sampling/interval recording
  - Momentary time sampling
  - Partial interval recording
  - Whole interval recording

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)

Observation Systems

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

Observation Systems

- **BEACHES**
  - Individual children at home and elsewhere
- **SOFIT**
  - PE and instructional classes
- **SOPLAY**
  - Group behavior at leisure at school
- **SOPARC**
  - Group behavior in parks and communities
  - Includes age and race/ethnicity groupings
- **SOCARP**
  - Individuals on playgrounds
  - Includes group size, activity type, and social interactions

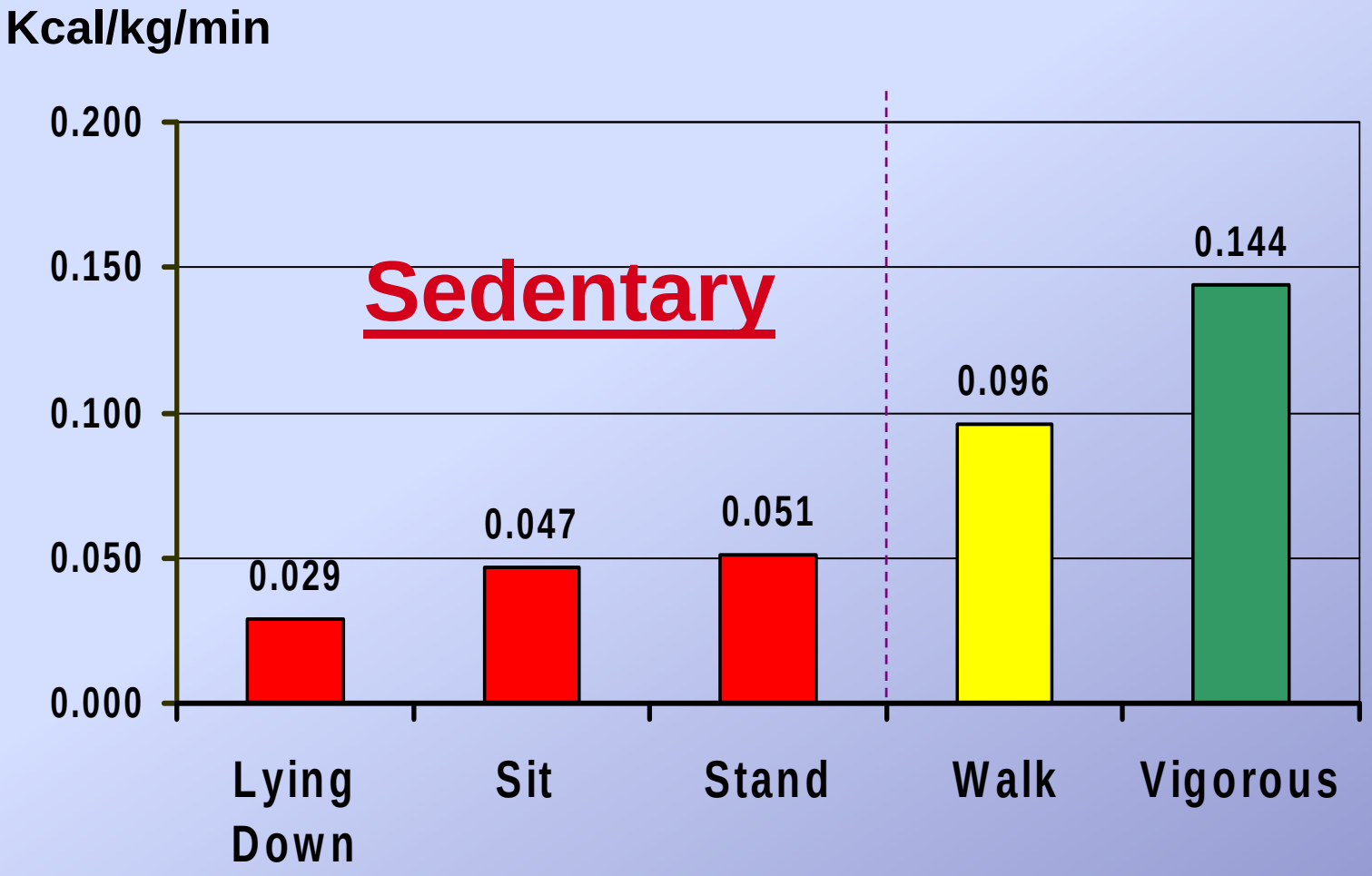
Methodological Considerations (1)

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

System Validation (1)

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

Estimated Energy Expenditure



Reliability

Consistency:

degree to which independent, trained observers produce the same results when simultaneously observing:

- **the same events**
- **using the same coding definitions, procedures, and conventions**

Observer Variability

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

Methodological Considerations (2)

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

Physical Activity Data

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

  - Number of people
  - Proportion in activity levels

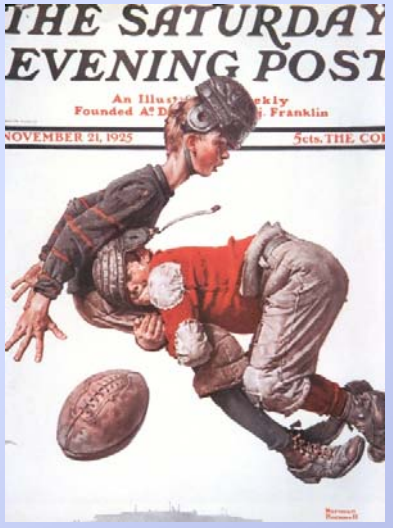
Physical Activity Occurs within Specific Environments

- In transport
- At home (play, work)
- Recreation (structured, unstructured)
- Sports (Youth, Senior)

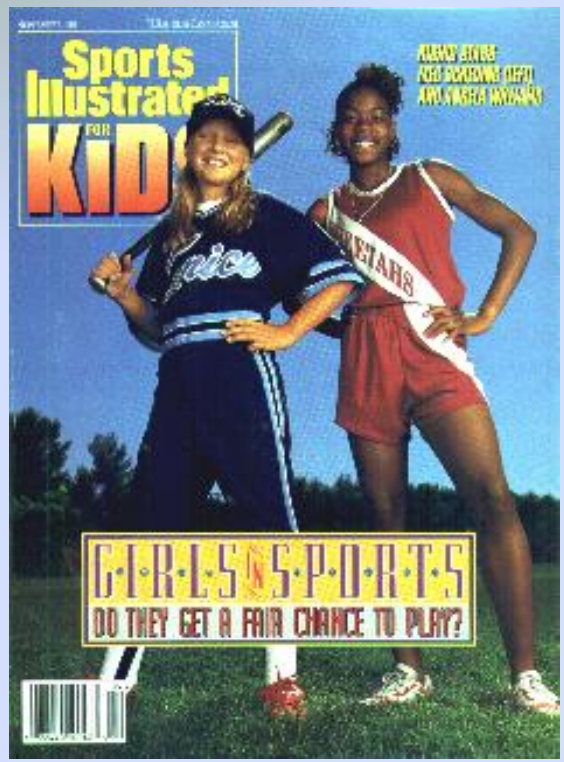
- **Schools**
  - PE Classes; Intramurals; Interscholastics;
  - Clubs; Free Play

Environment

- Social



- Physical


Sports Illustrated
FOR KIDS
GIRLS IN SPORTS
DO THEY GET A FAIR CHANCE TO PLAY?

When to Use Observational Assessments

- Formative
- Process
- Outcome

Home Settings

BEACHES Contexts

(Revised version, 2005)

- 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)

(McKenzie et al., 1991, JABA, 24, 141-151)

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., *JPAH*, 2008

Aventuras para Niños

School Settings

PE Classes; Recess;

Intramurals; Inter-scholastics;

Clubs; Free Play

SOFIT Categories

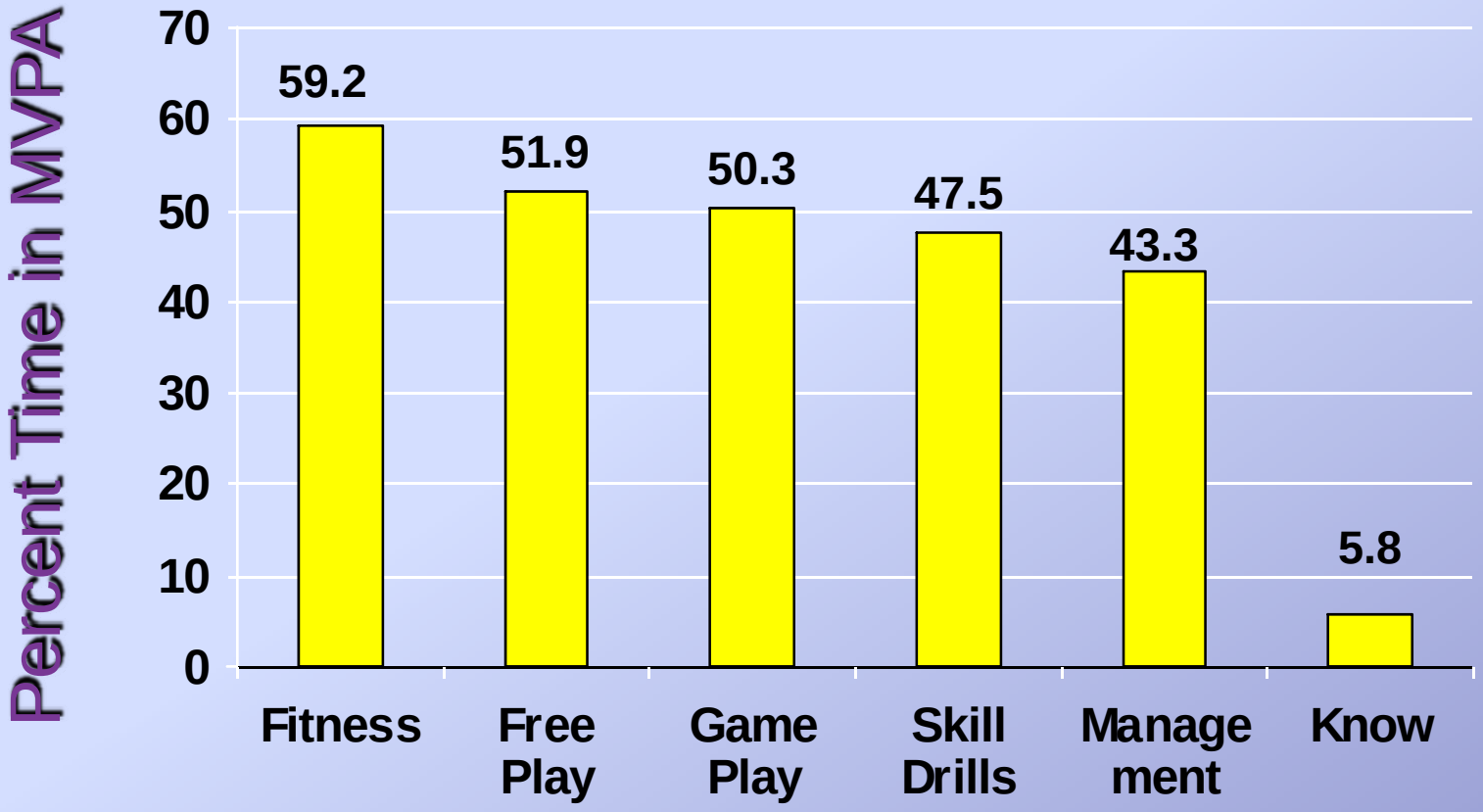
- Physical Activity
  - Lying Down, Sitting, Standing, Walking, Vigorous
- Lesson Context
  - Management, Knowledge, Fitness, Skill Drills, Game Play, Other
- Instructor Behavior/Interactions

SOFIT Entry Form

Abbreviated

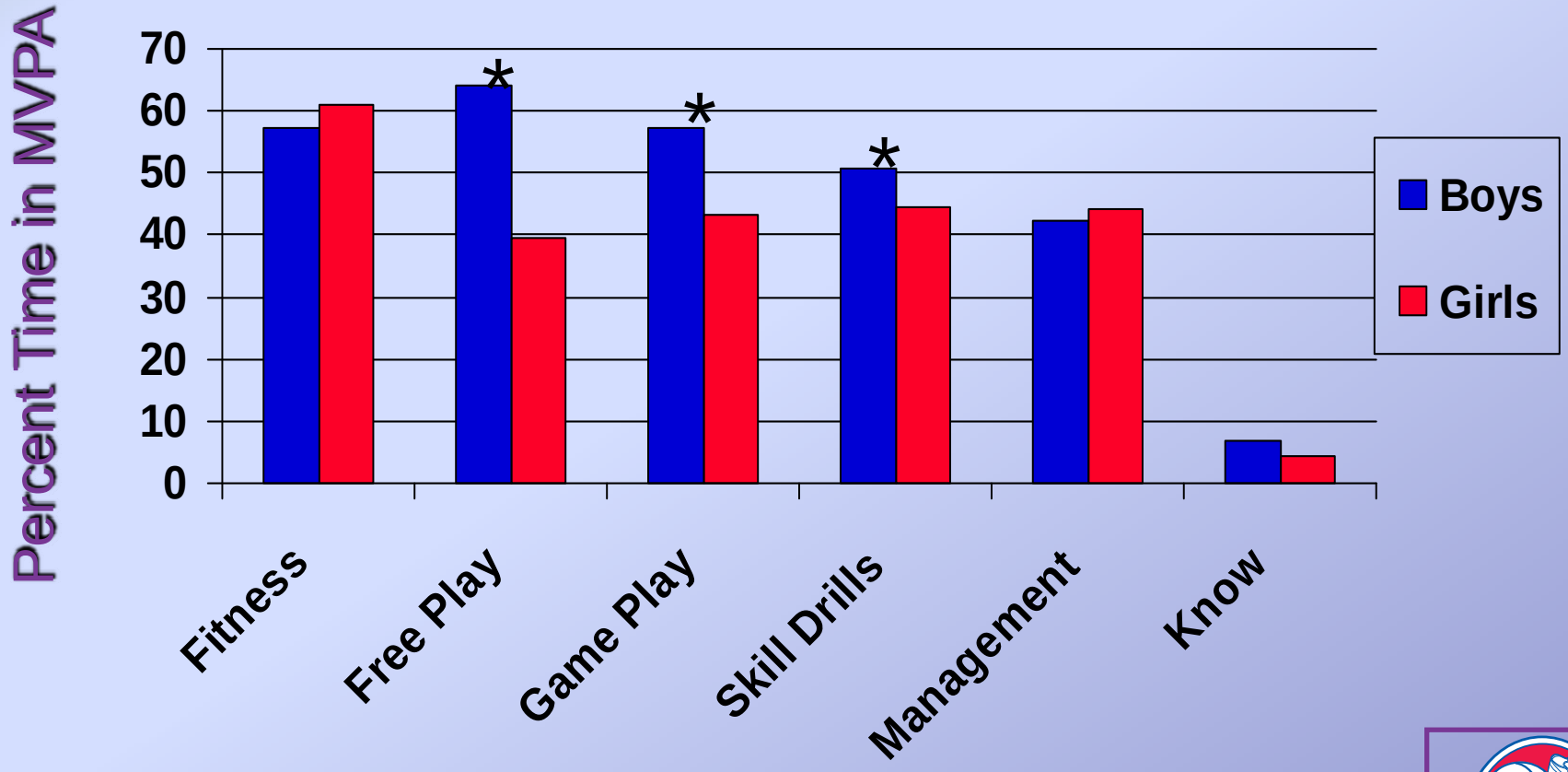
Int	Activity	Context	Interactions
1	1 2 3 4 5	M K F S G O	I O N
2	1 2 3 4 5	M K F S G O	I O N
3	1 2 3 4 5	M K F S G O	I O N

MVPA by Lesson Context



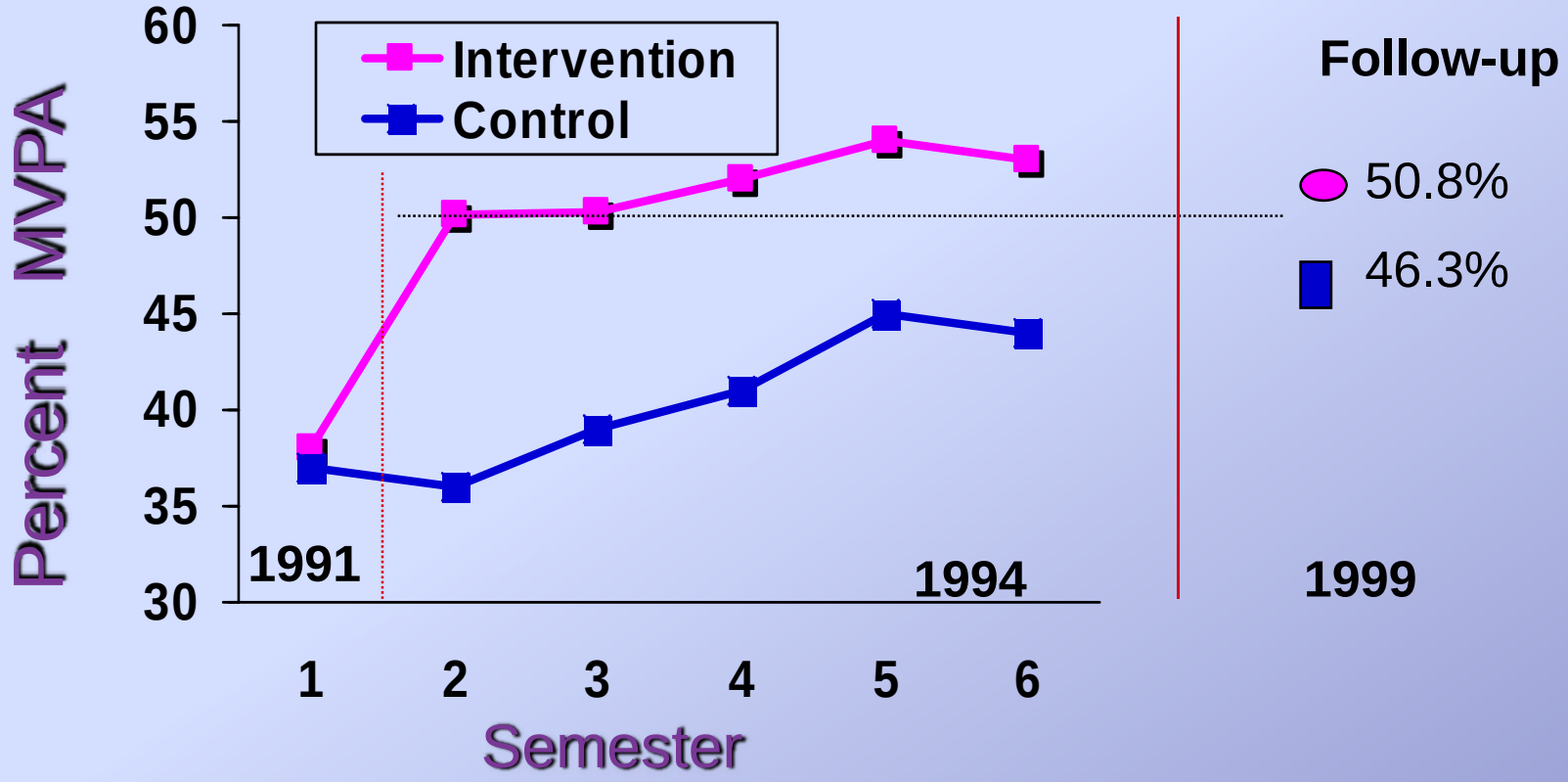
N=24 schools; 430 lessons; McKenzie et al, 2000, *RQES*

MVPA by Gender and Context



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

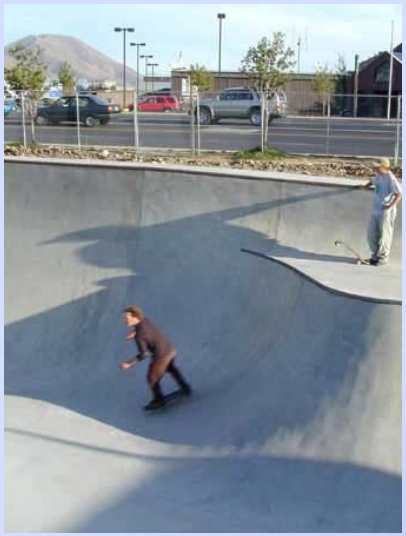
CATCH PE: Short- and Long-Term Effects on MVPA in PE



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

If You Build It, Will They Come?

If They Come, Will They Be Active?



SOPLAY Categories

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

SOPLAY

(McKenzie et al., 2000, Preventive Medicine)

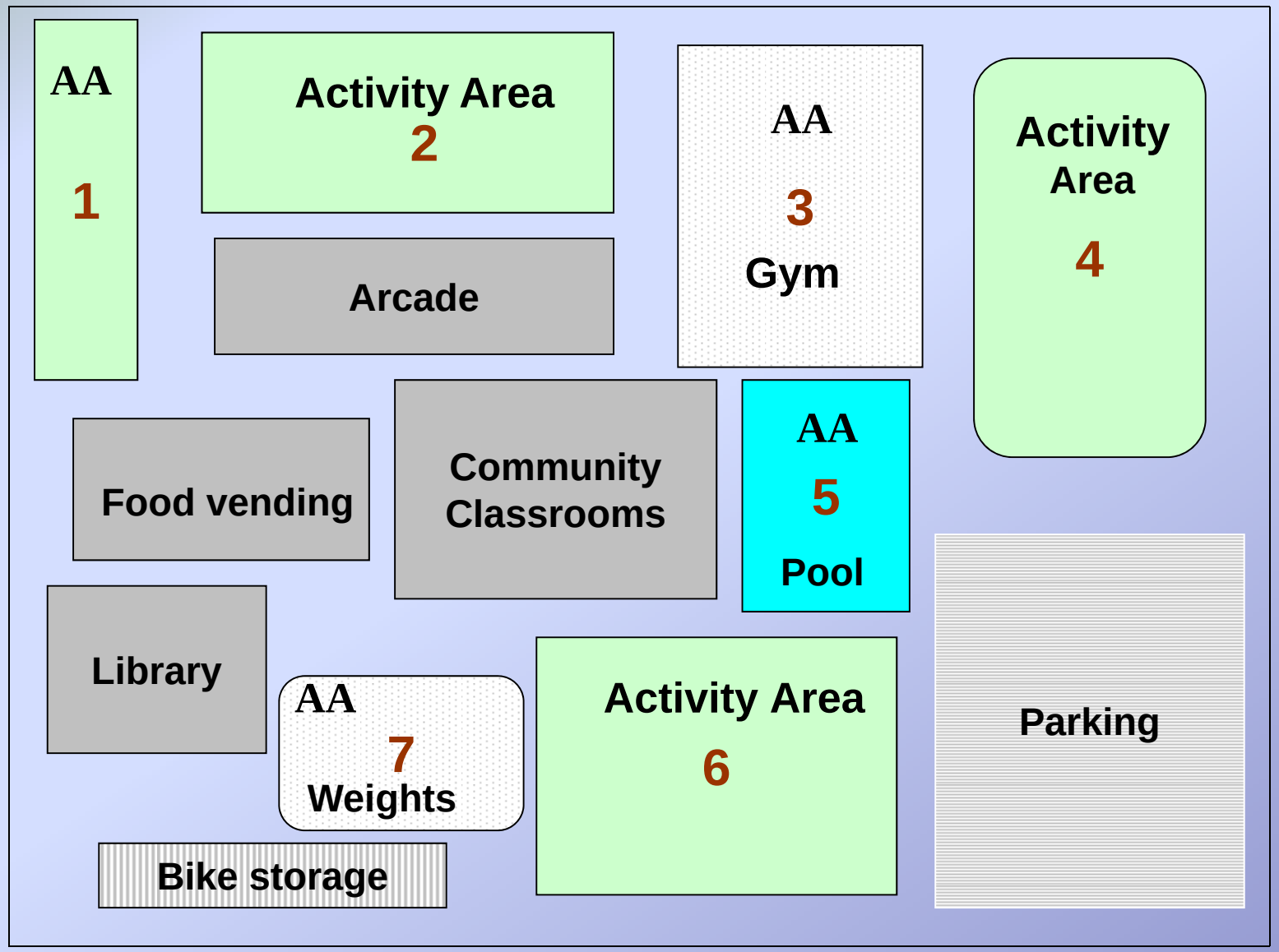
- Observers scan target areas and record activity intensity of each person
- Three levels: sedentary, walking, and vigorous
- Simultaneous entries for relevant PERSON and ENVIRONMENTAL characteristics

SOPLAY/SOPARC

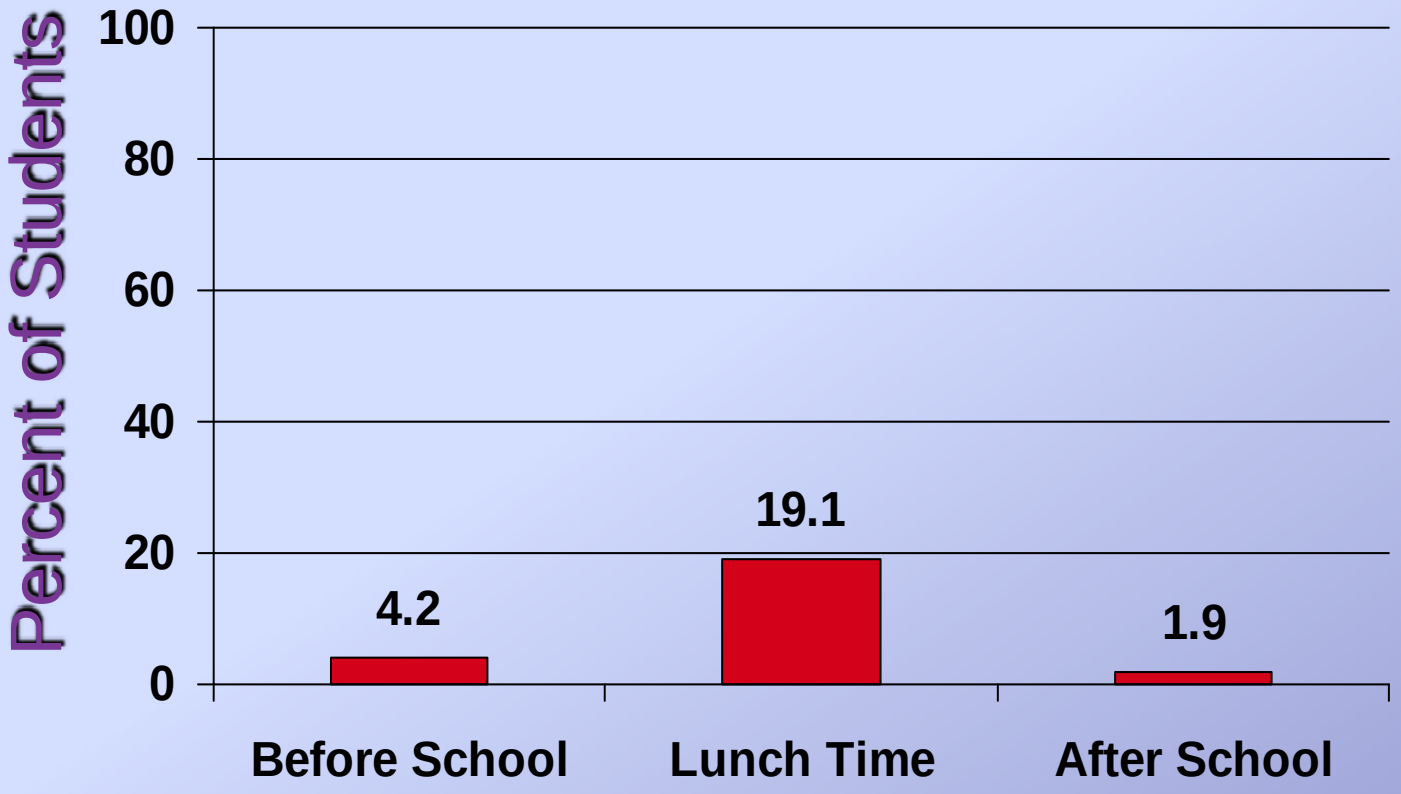
Transitory Area Characteristics Assessed

- Accessible
- Usable
- Supervised
- Organized
- Equipped

McKenzie School-7 Activity Areas



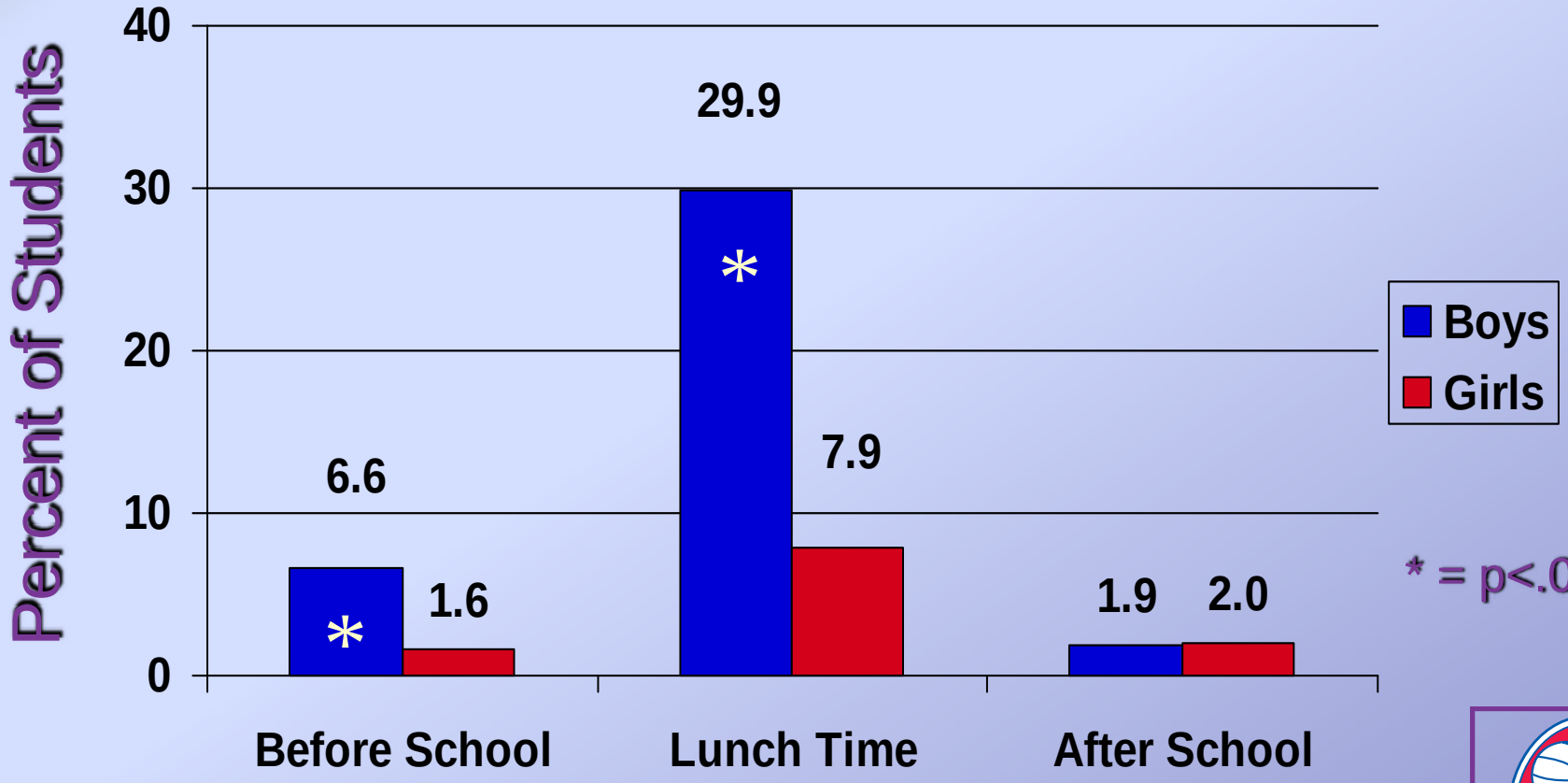
Percent of School Population in Activity Areas



N=24 M-SPAN schools; 151 areas

(McKenzie et al., 2000, Preventive Medicine)

Percent in Activity Areas

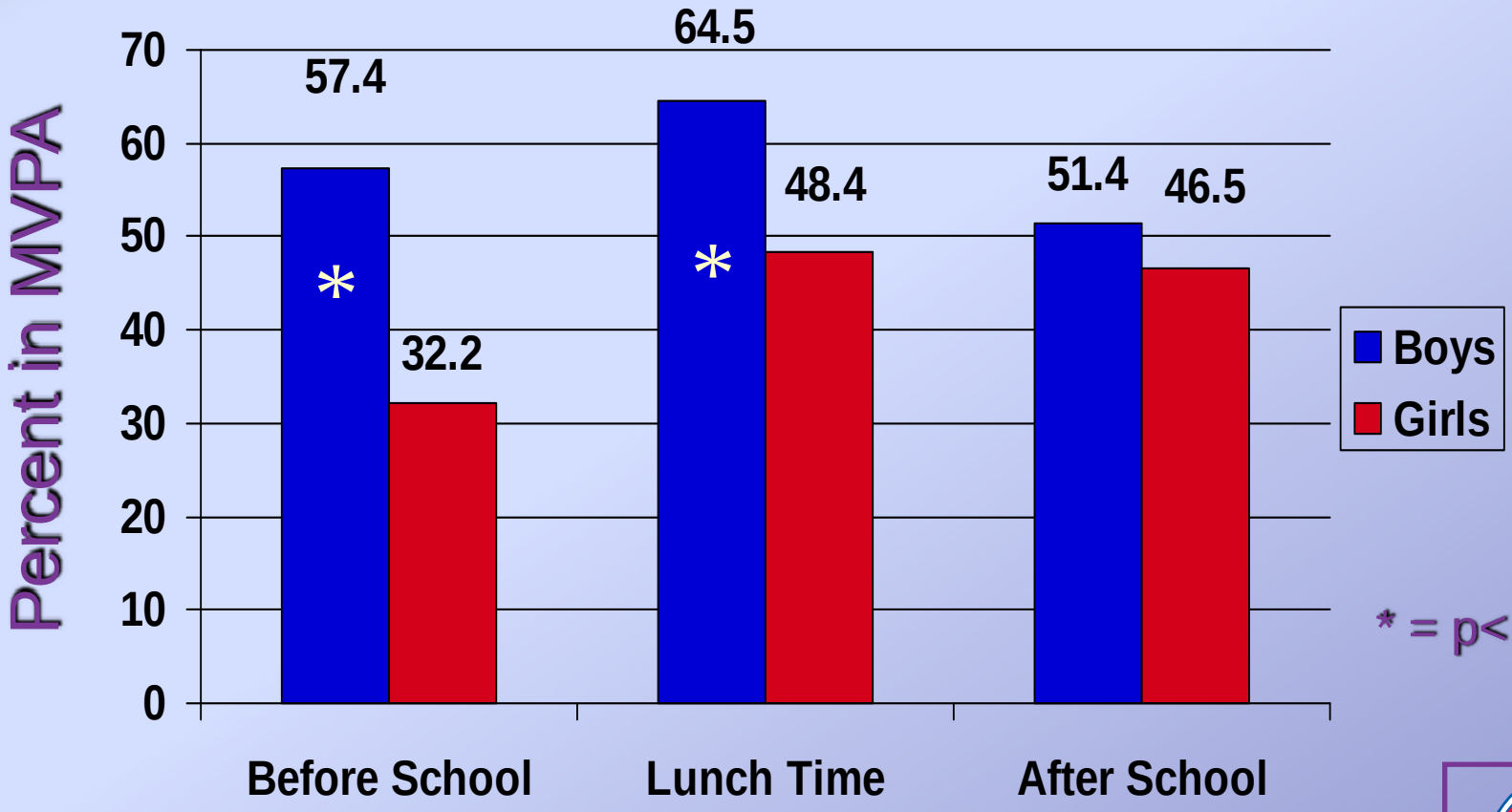


* = p<.001

N=24 M-SPAN schools; 151 areas

(McKenzie et al., 2000, Preventive Medicine)

MVPA by Gender



N=24 M-SPAN schools; 151 areas

(McKenzie et al., 2000, Preventive Med)

Community Settings

Parks and Recreation Centers

SOPARC

System for Observing Play and Recreation in Communities

T. McKenzie & D. Cohen

San Diego State University & RAND Corporation

(McKenzie et al., *JPAH*, 2006)

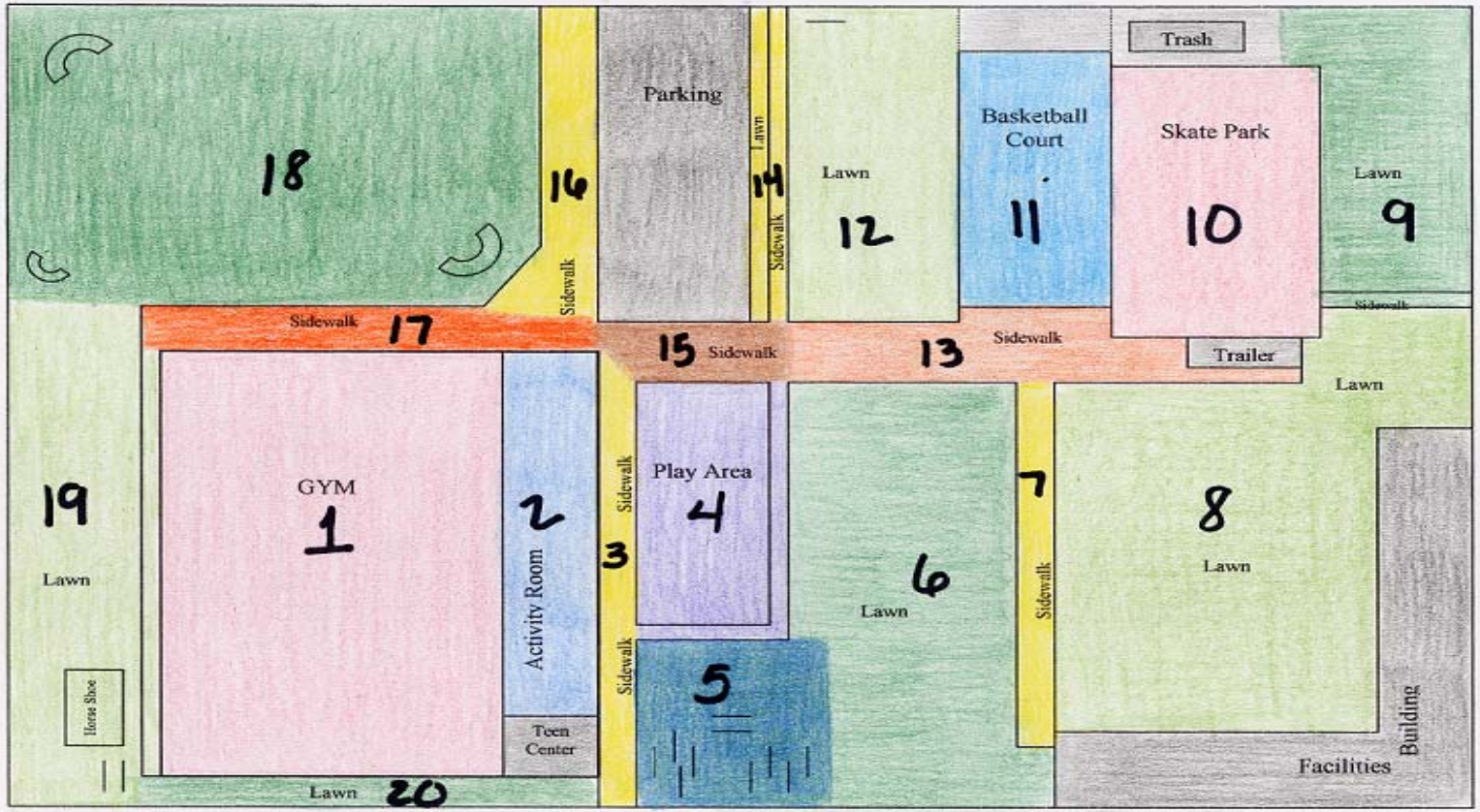
SDSU

RAND Health

PURPOSES

- Interest in health disparities
- Developed and assessed tool for studying PA and associated variables in community settings
- Used system in multi-ethnic communities to study park areas and characteristics of users, including their PA

WILMINGTON RECREATION CENTER



Leavitt Park--OPEN Project

Justice Myron E. Leavitt Family Park

CITY OF LAS VEGAS
Department of Leisure Services
Living...Beyond The Neon

Legend

- Target Zone
- Trail observation point
- Observation point

37 Target Areas
-mostly sports

N
W E
S

2100 E. St. Louis Ave.
MRC 10.13.09

First Study-Los Angeles

- LOCATION
  - 8 neighborhoods:
  - High household poverty (X=35%; range=16-55%)
  - High % of minority groups (2000 census)

    Latino, range=16-55%

    African-American, range =0-88%

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., *JPAH*, 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%

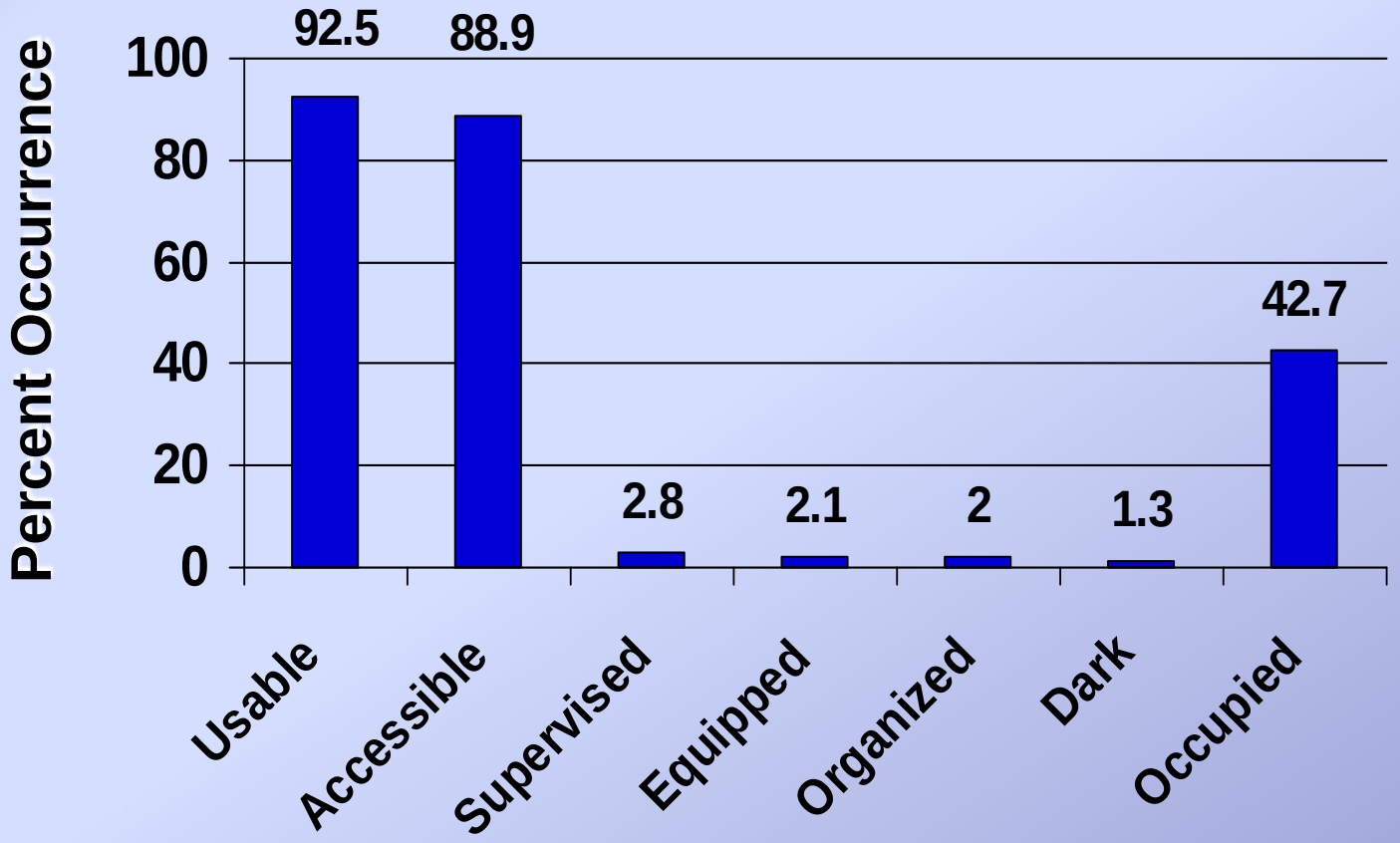
NUMBER COUNT FOR AREA

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

PEOPLE CHARACTERISTICS (Overall)

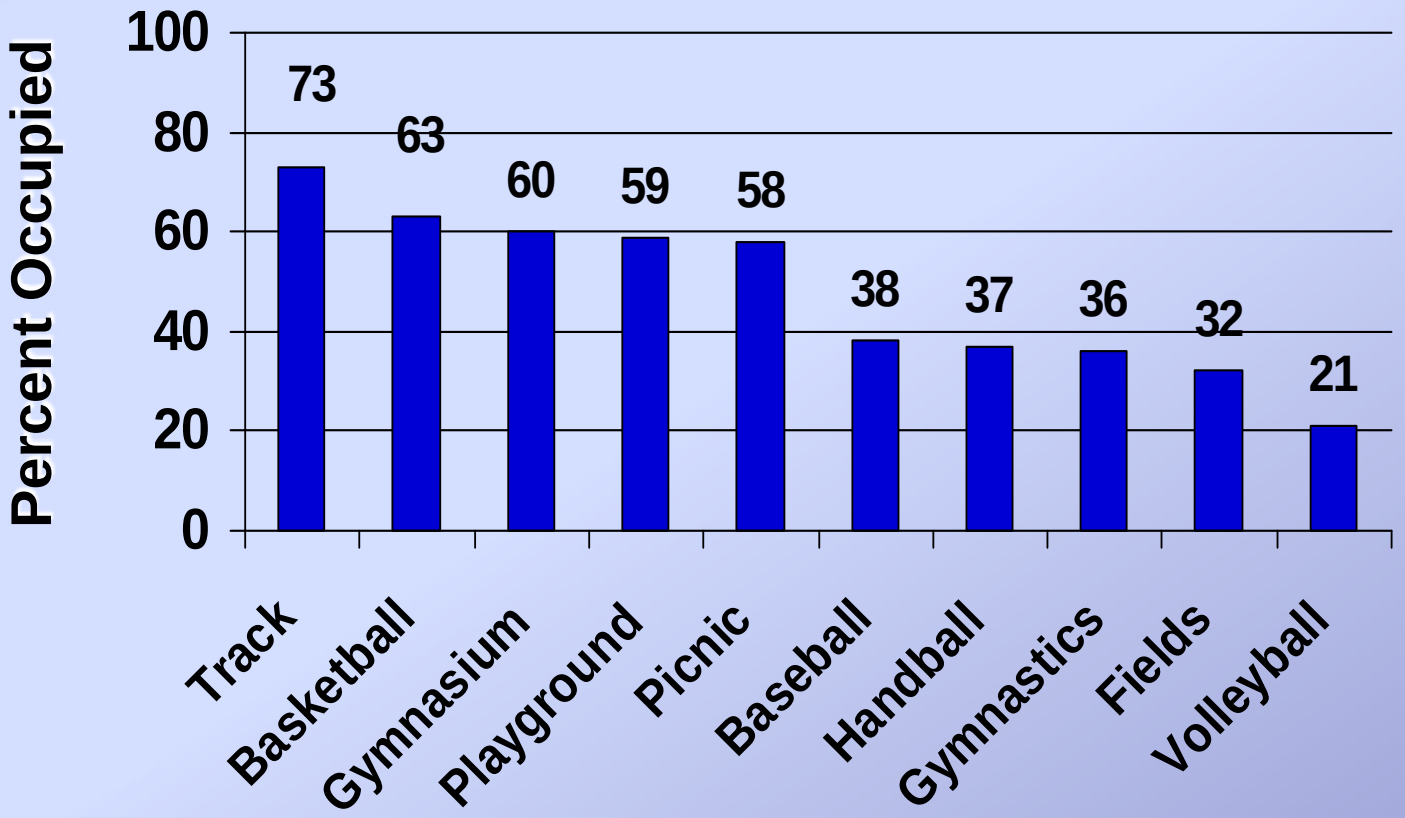
- Age Grouping: Females, 95%; Males, 97%
- Ethnic/Race Grouping: Females, 99%; Males, 99%
- Physical Activity Level: Females, 90%; Males, 88%

Characteristics of Activity Areas

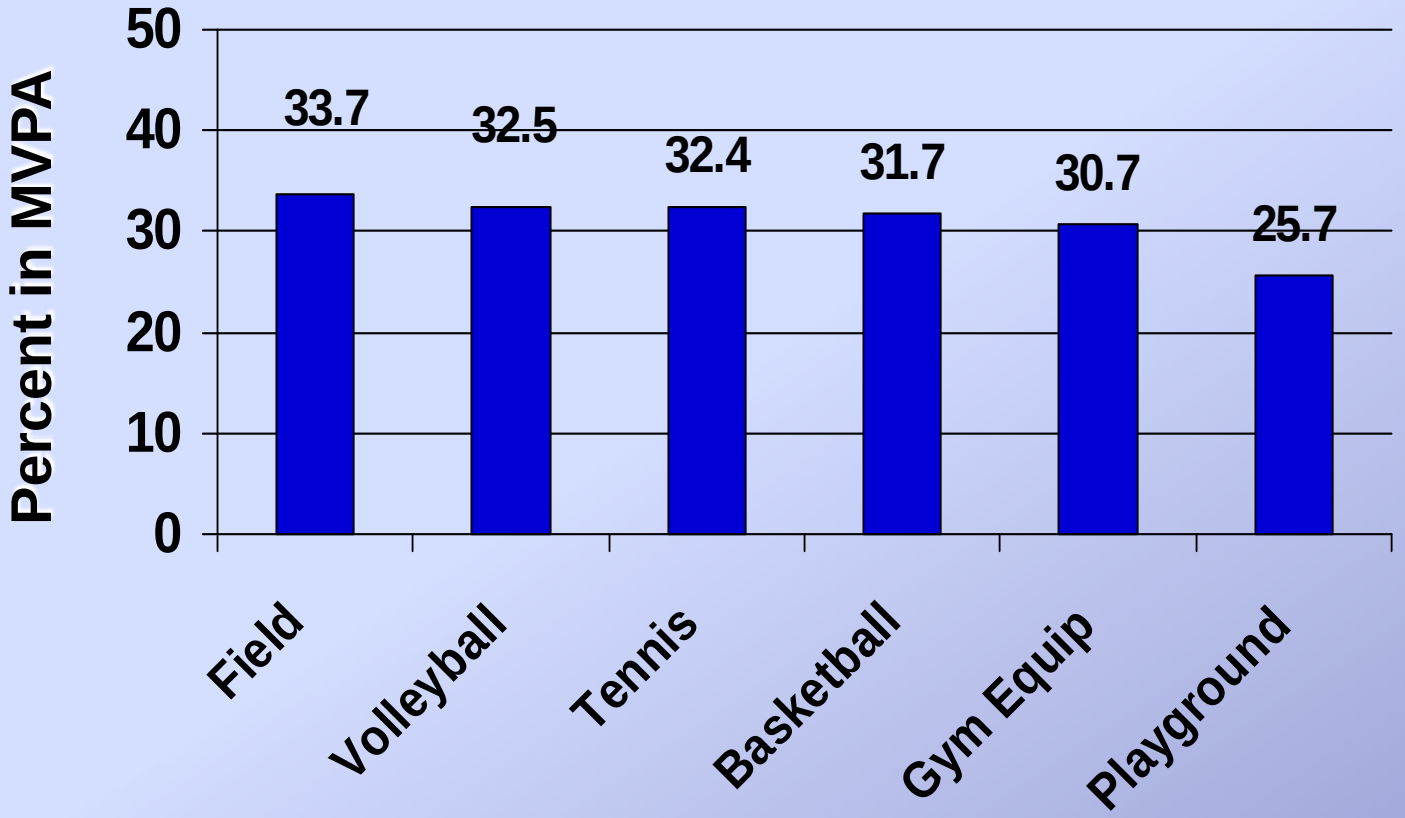


N=8 Parks; 165 Activity Areas; 4511 Visits

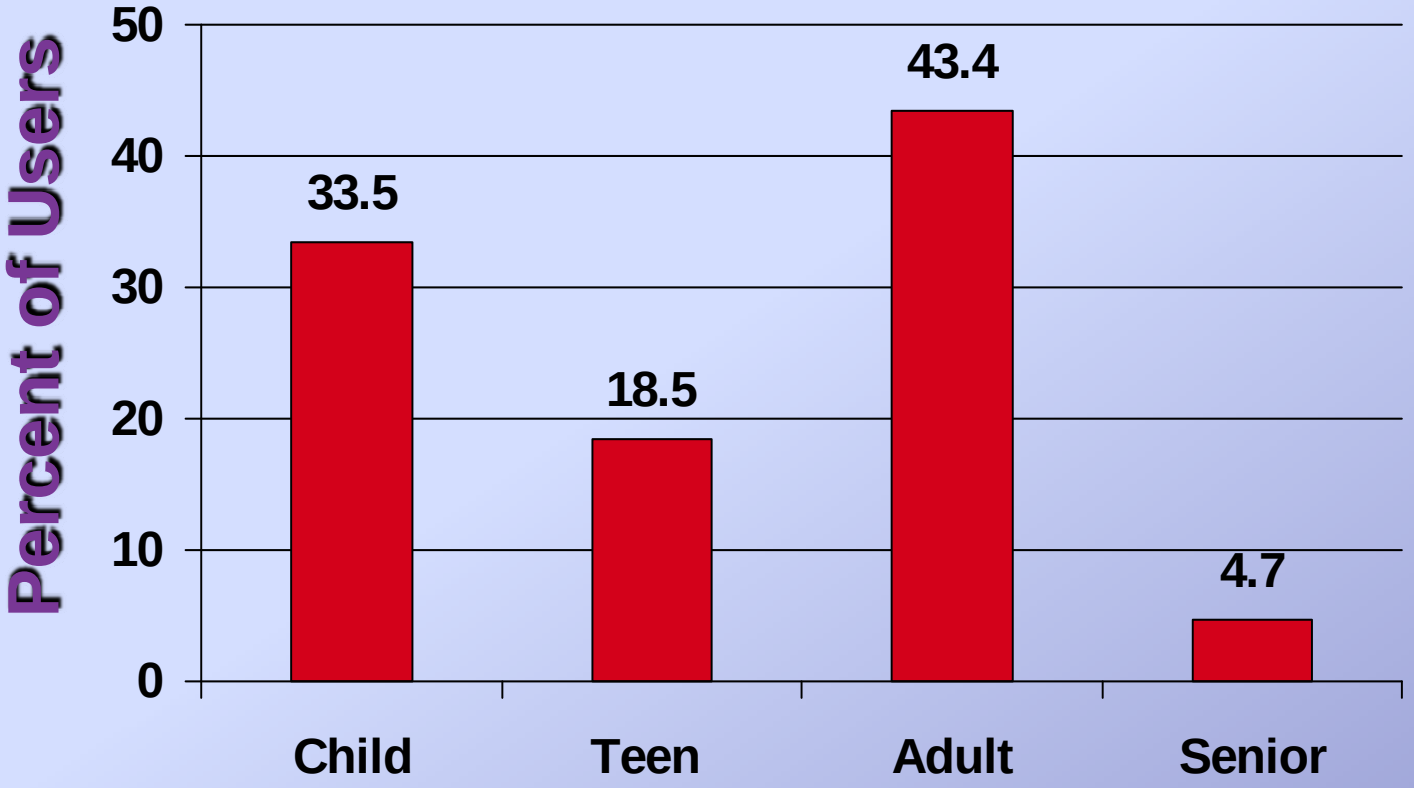
% Activity Areas Occupied



Areas with Most MVPA

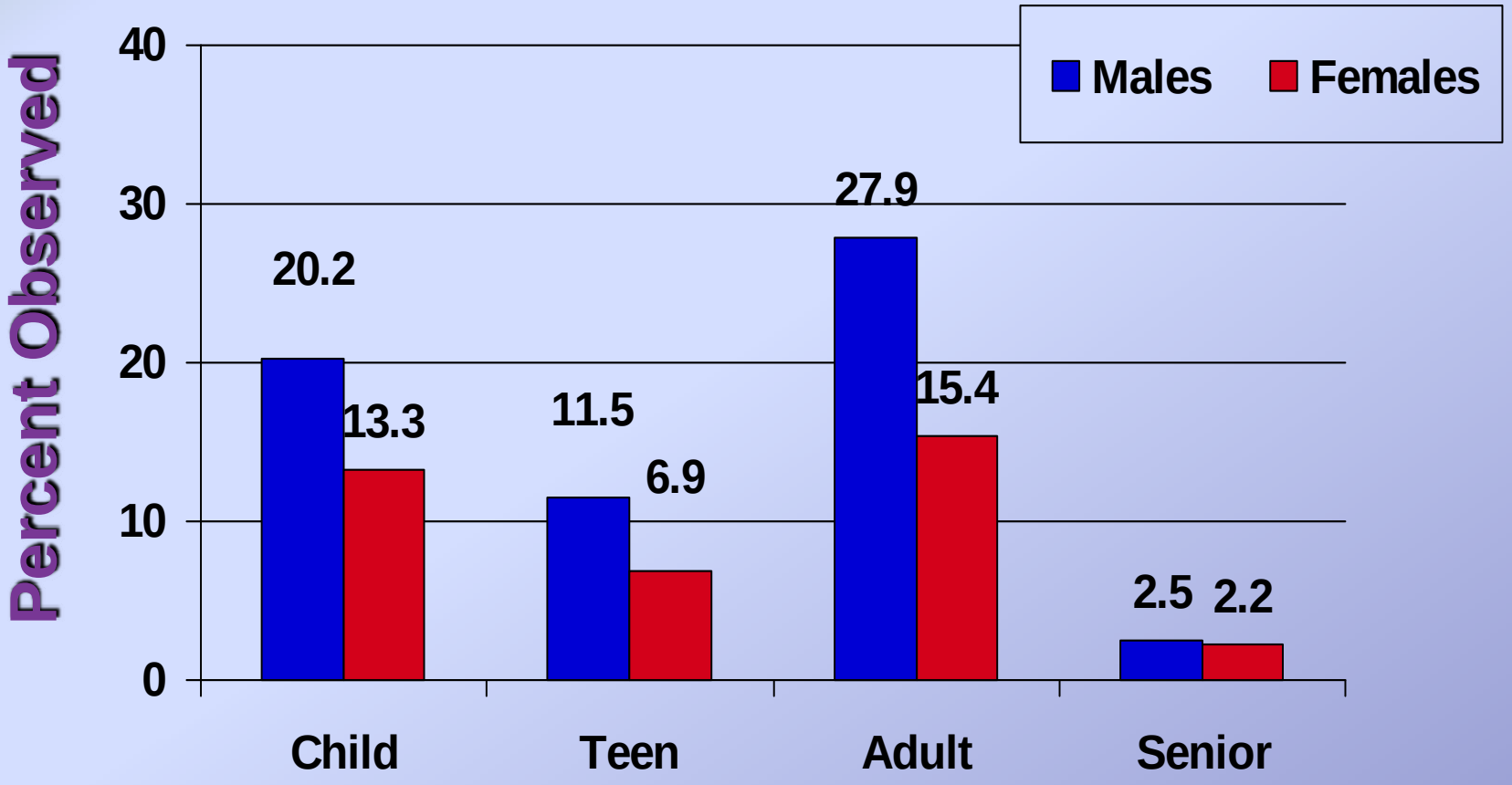


Park Users: Age Categories



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

Park Users: Gender and Age



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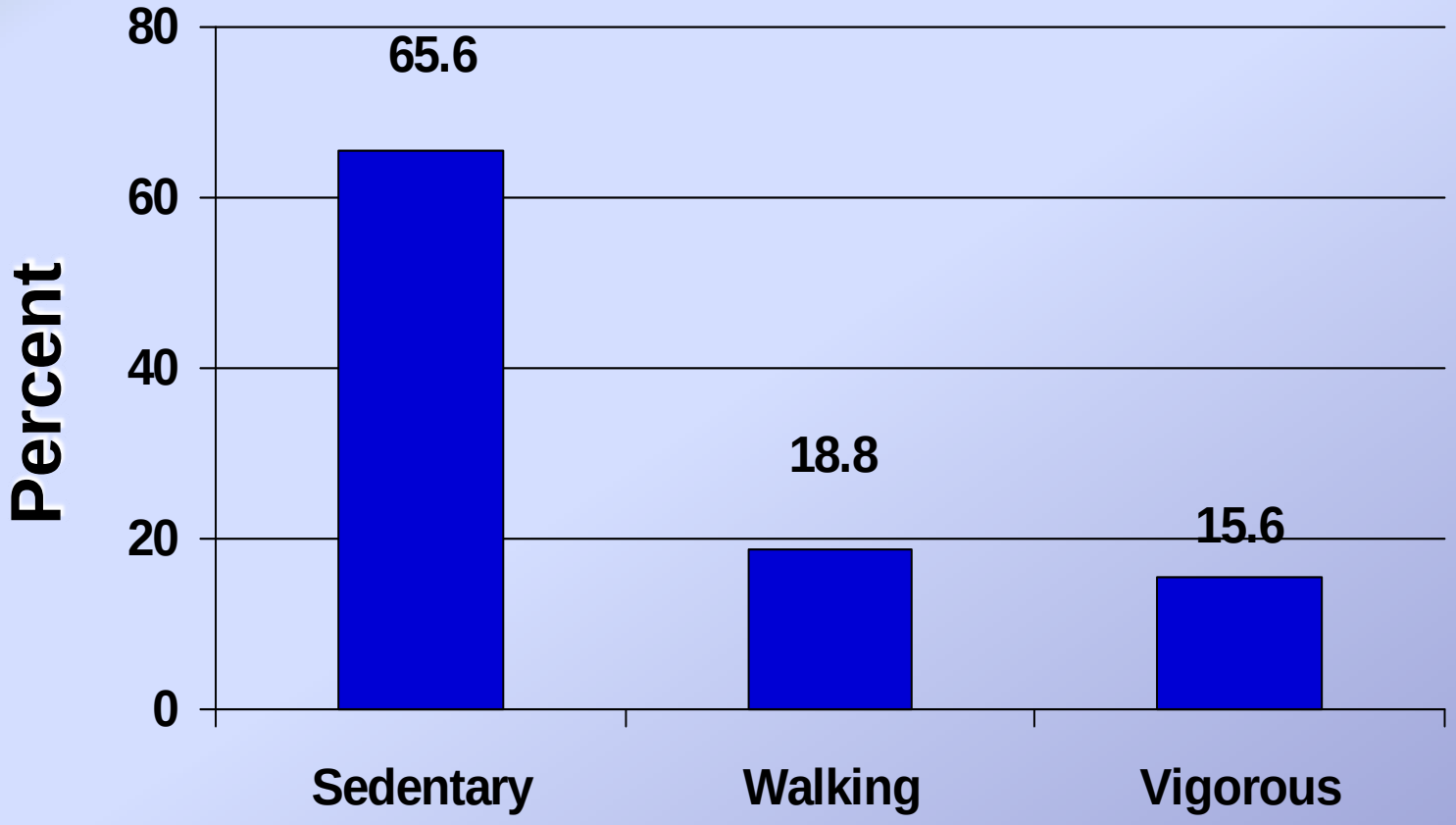
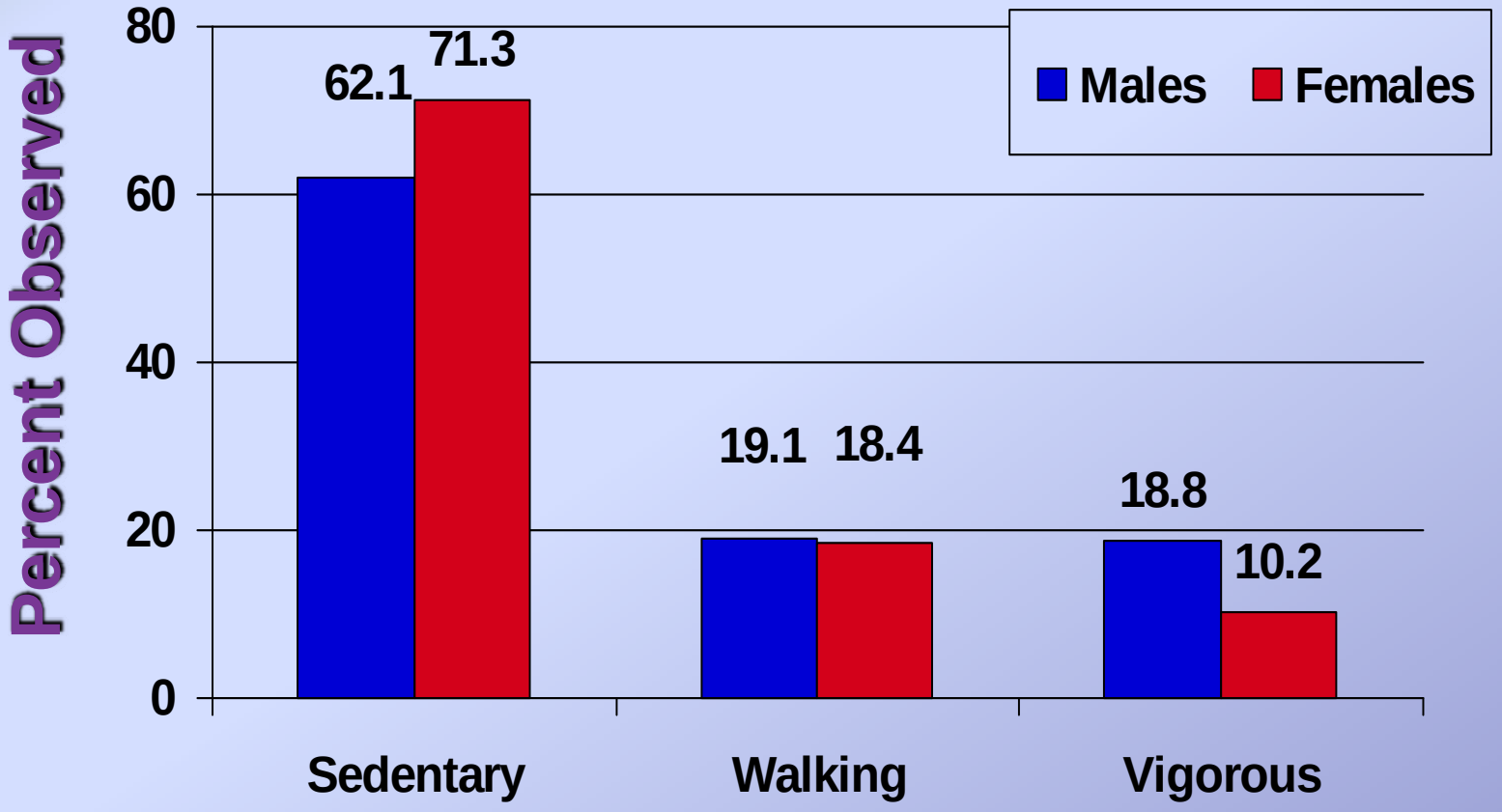
Physical Activity Levels



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

Activity Levels by Gender



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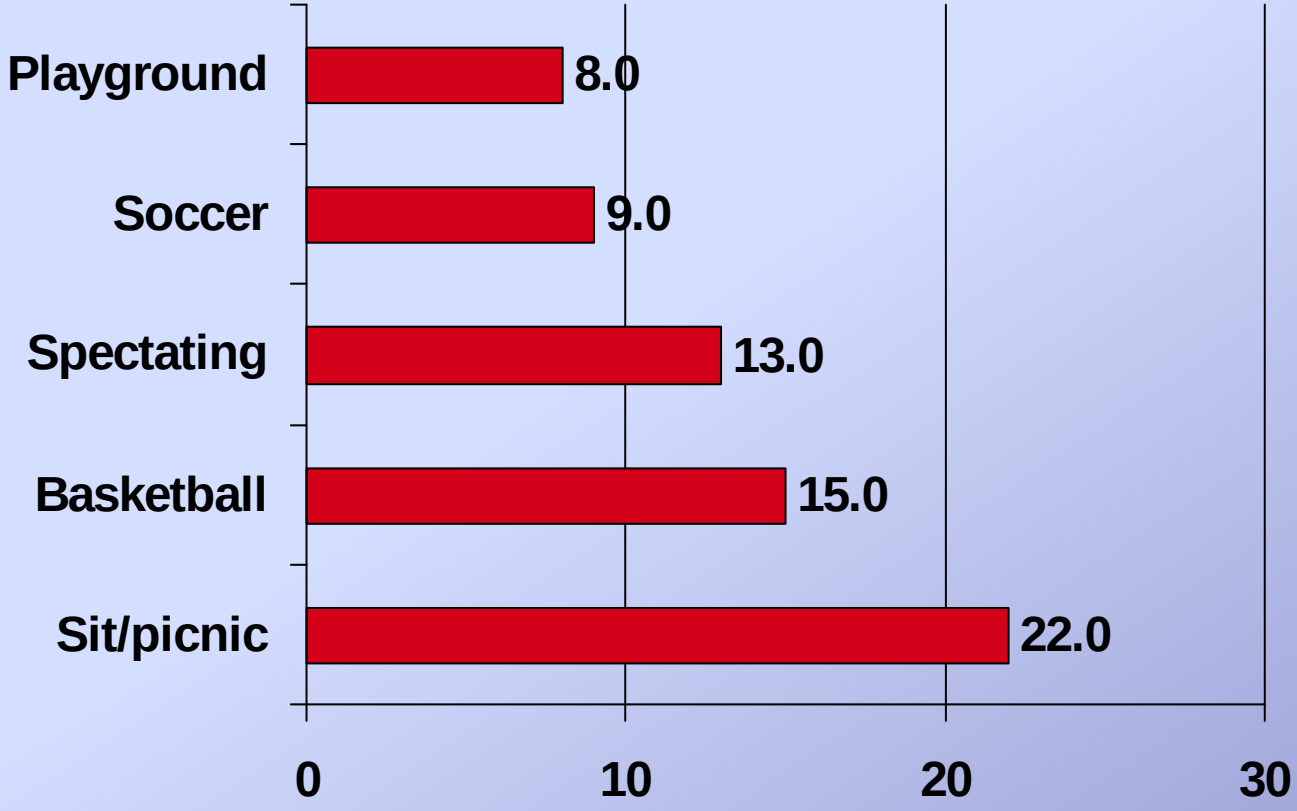
Most Common Activities: Percent of Park Users



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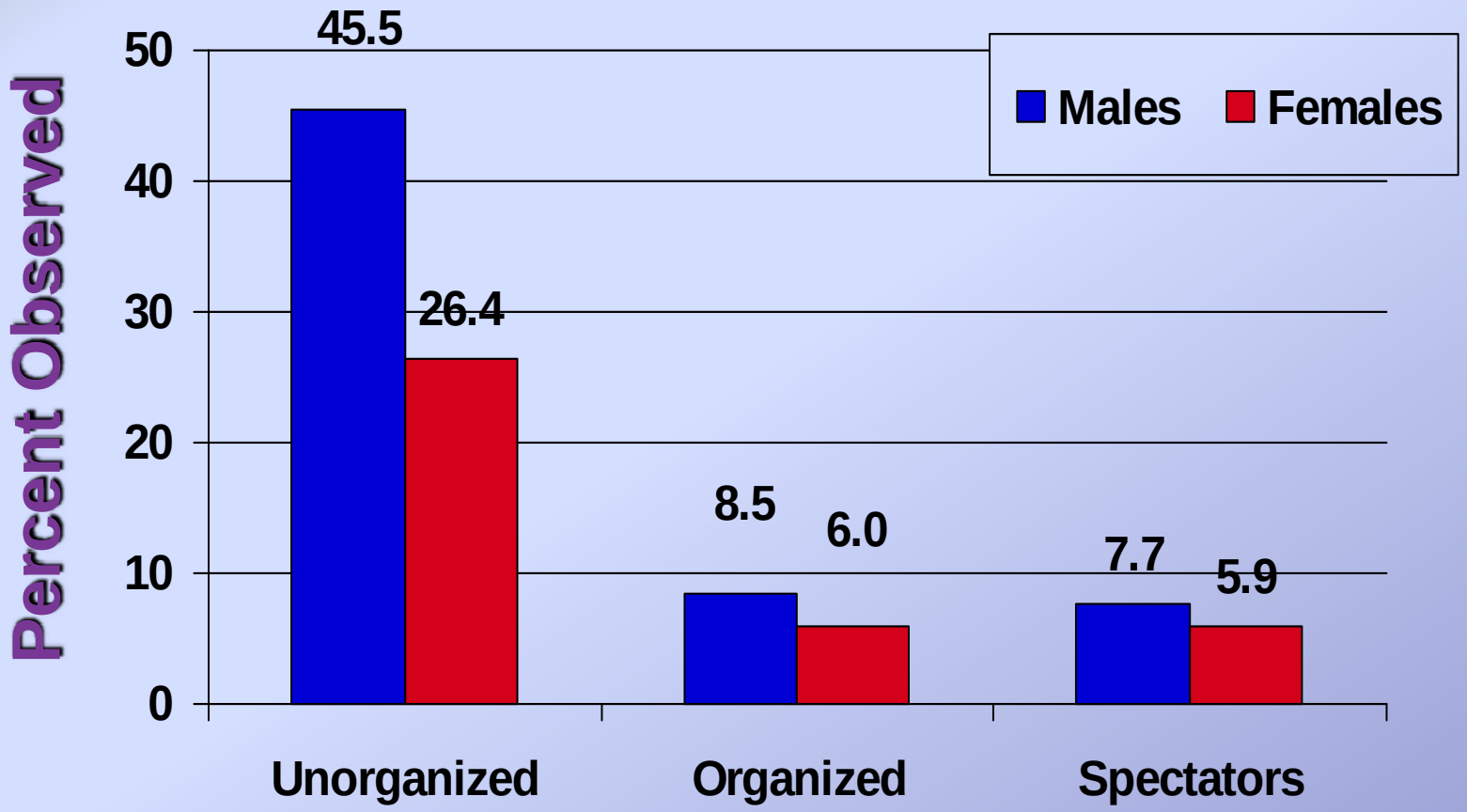
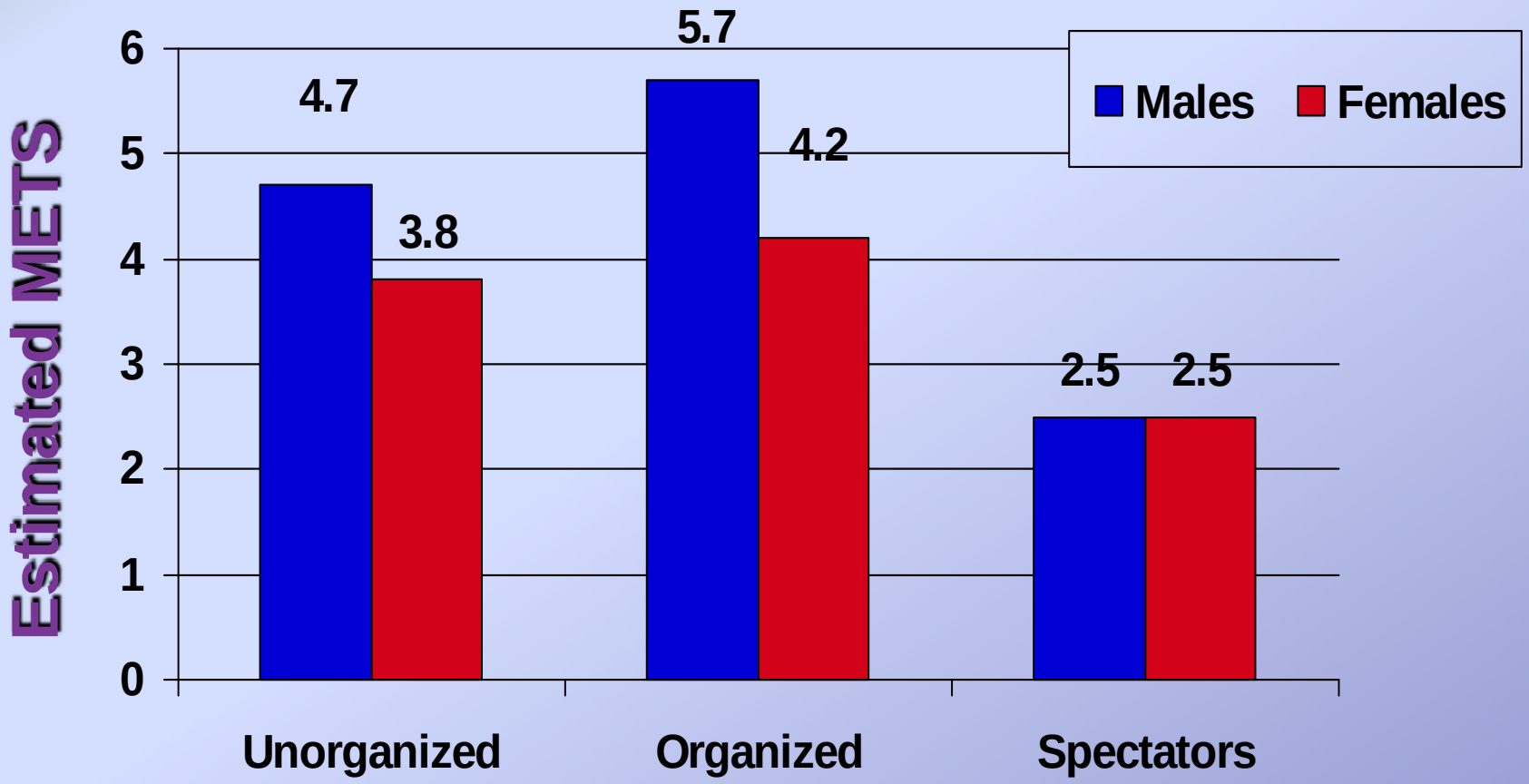
% Park Users by Activity Type



N=16,189 people; 165 activity areas; 56 days

METS by Activity Type



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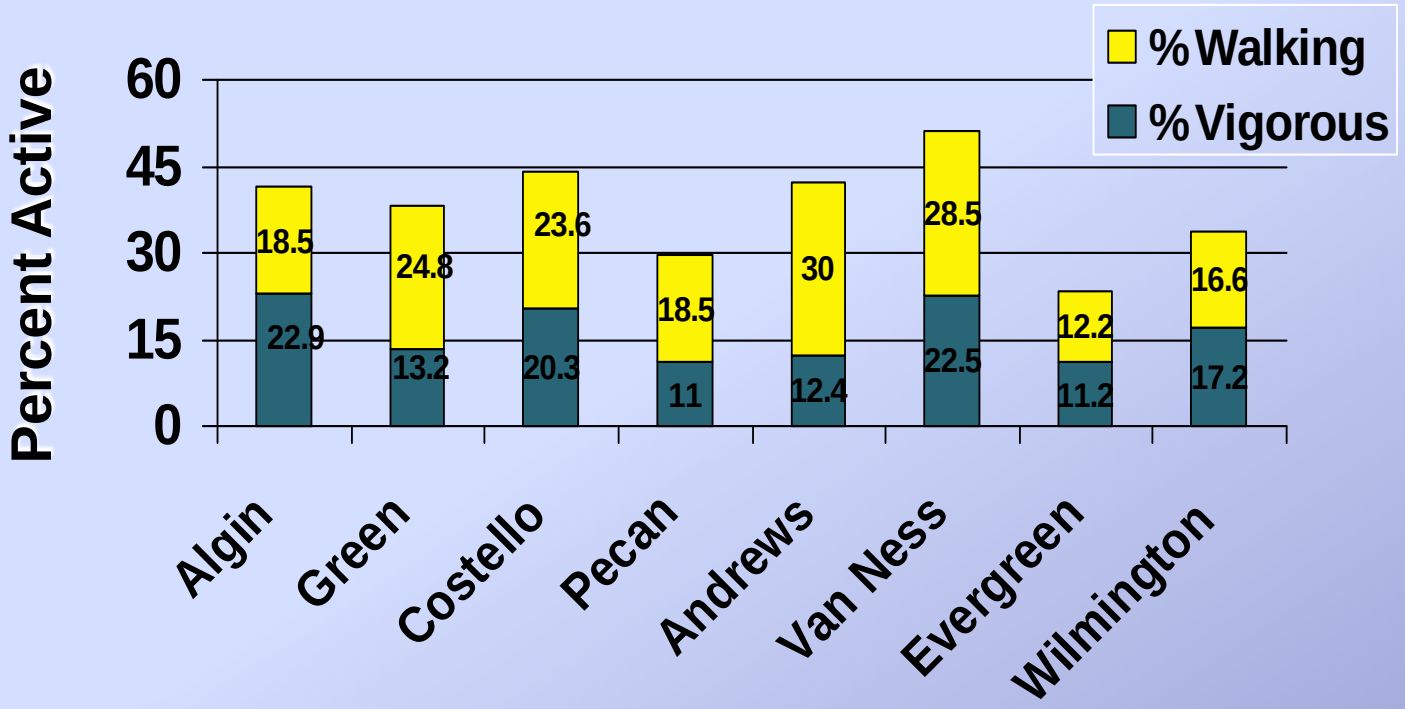
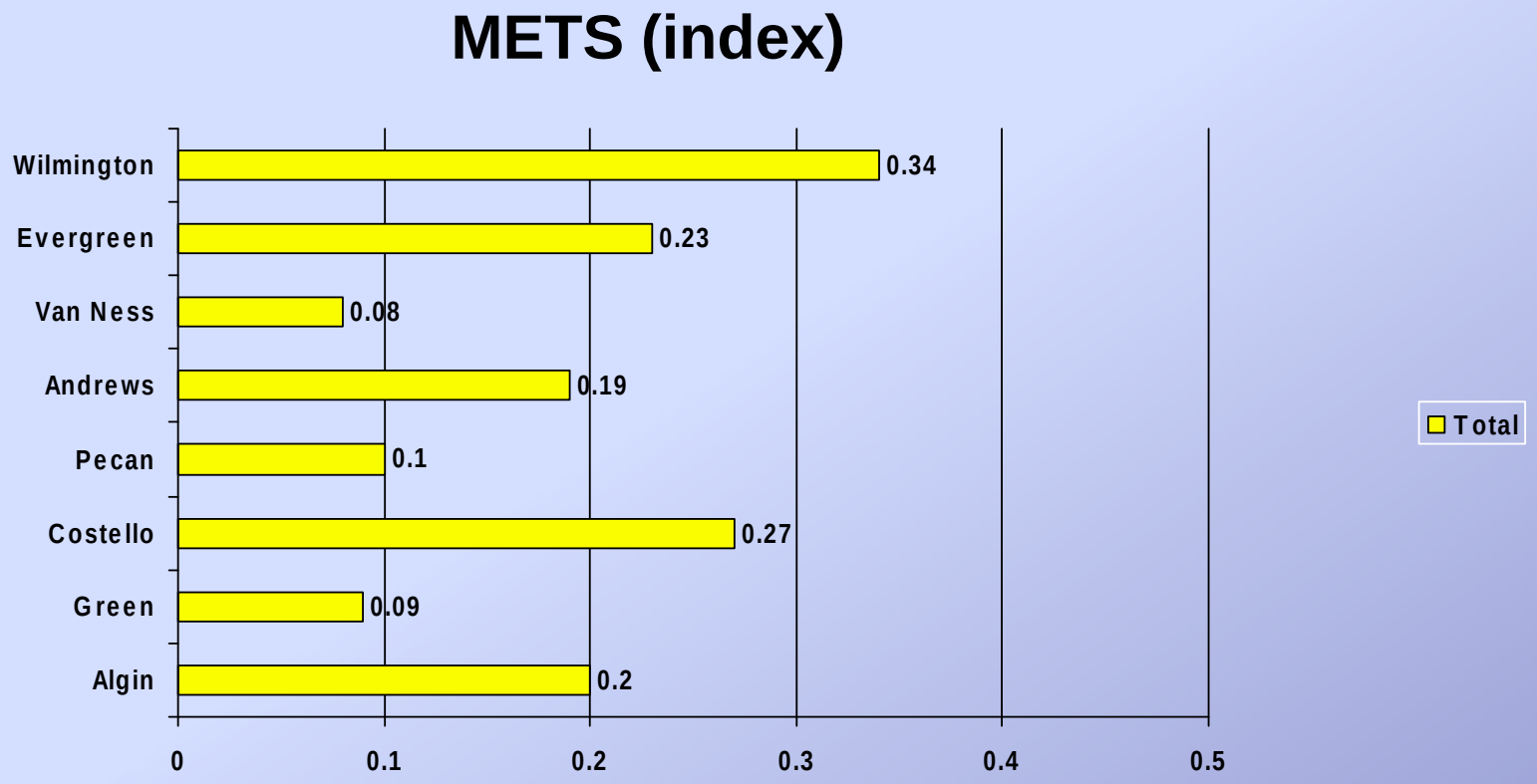
Proportion Walking and in Vigorous Activity in 8 Parks



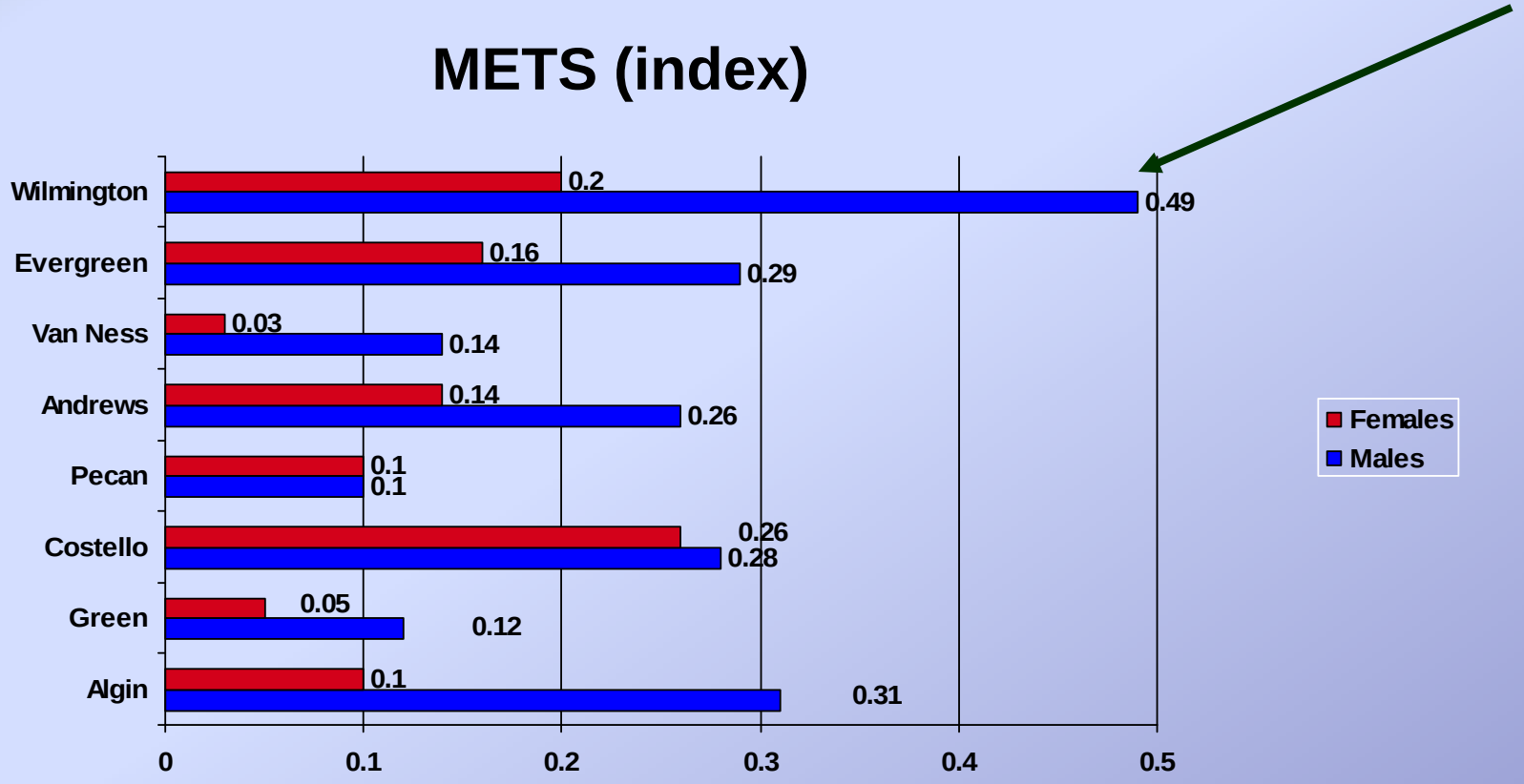
N=16,048 people; 165 activity areas; 56 days

METS Expended Per Resident Within One Mile of Park



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

METS Expended in Park Per Resident Within One Mile



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

System for Observing Physical Activity & Recreation in Natural Areas (SOPARNA)

World Wilderness Congress
Mérida, Yucatan, MEXICO

Thomas L. McKenzie, Ph.D.*
Vinod Sasidharan, Ph.D.* & Deborah Chavez, Ph.D.**

*San Diego State University, **USDA Forest Service,
Pacific Southwest Research Station

Review

- Background
- Research Issues
- Practical Issues
- Examples: Micro environments

THANK YOU!

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