

# Physical Activity of Children in Preschools

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# Outline

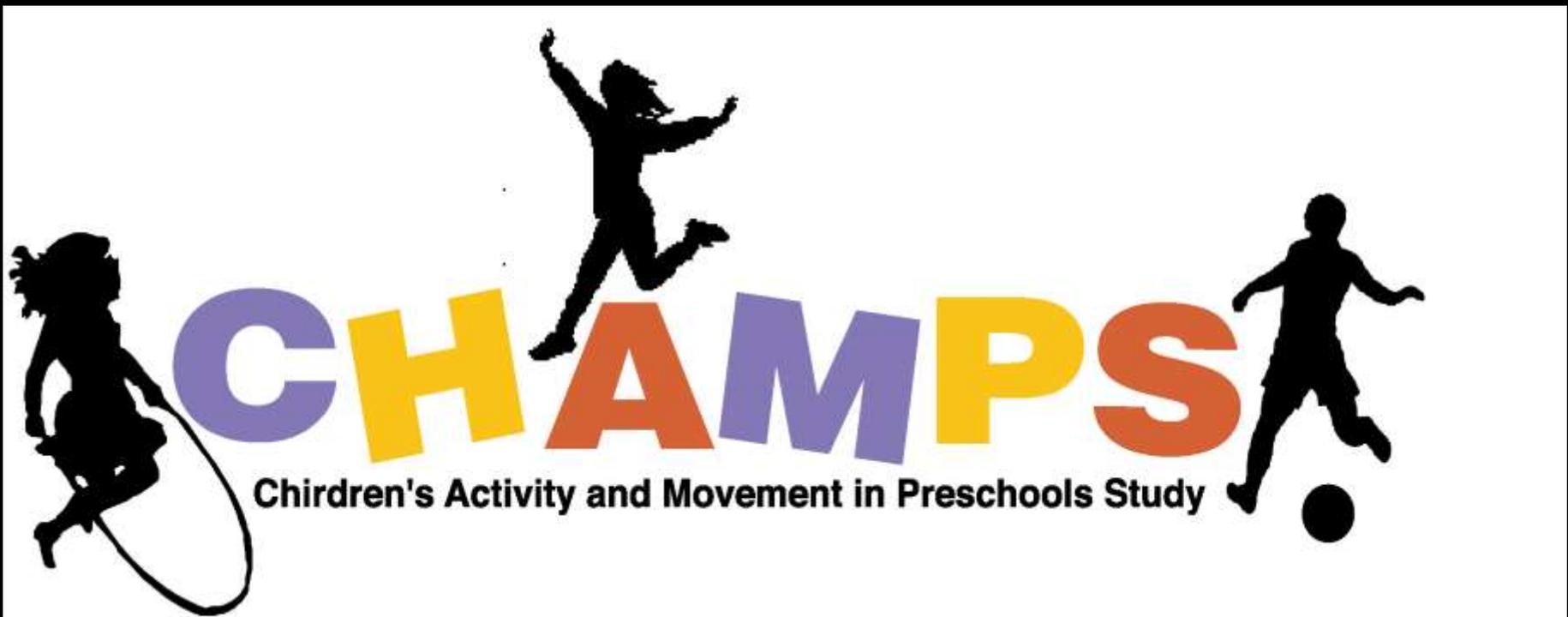
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- Measurement Methods
  - Direct Observation
  - Accelerometry
- Physical activity levels in Preschools
- Factors associated with physical activity



# Children's Activity and Movement in Preschool Study

Funded by National Institute of Child Health and Human Development (NICHD)



# Direct Observation

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# Assessment of Physical Activity

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- Observational System for Recording Physical Activity in Children-Preschool Version (OSRAC-P)
  - Momentary time sampling observation system
  - 5-sec observe interval, then 25-sec record interval for each 30-second observation interval.
  - PA level and activity type, social environment (e.g., initiator of activity, group composition), and nonsocial environment (e.g., child location and activity contexts)

# Assessment of Physical Activity

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- Physical activity levels
  - Level 1: Stationary
  - Level 2: Stationary with limb movement
  - Level 3: Light activity (slow, easy movement)
  - Level 4: Moderate activity
  - Level 5: Vigorous activity
- Sedentary Category: levels 1 & 2
- Active Category: levels 3, 4, 5
- MVPA Category: levels 4 & 5

# Assessment of Physical Activity

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- Data collected in 30-minute periods
- Each child observed for 10-12 periods
- Two observational intervals per minute, total of 600-720 intervals per child
- Observation periods randomly chosen, and spread across 10 days

# Assessment of Physical Activity

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- ❑ Observers had extensive training
- ❑ Reliability assessed during 12% of total observations
  - Inter-observer agreement (IOA) was good (83%-100%)
  - Kappa scores indicated good inter-observer reliability (0.80-0.95)
  - Mean Kappa for PA level was 0.82
  - Mean IOA was 91%
- ❑ INTMAN software with hand-held Dell Axim computers

# Observational System for Recording Physical Activity in Children-Preschool Version

## Categories and Accompanying Codes

| <u>Act Level</u> | <u>Act Type</u> | <u>Location</u> | <u>Indoor</u>       | <u>Outdoor/Gym</u> | <u>Act Initiator</u> | <u>Group</u> | <u>Prompts</u> |
|------------------|-----------------|-----------------|---------------------|--------------------|----------------------|--------------|----------------|
| 1 Stationary     | 1 Climb         | 1 Inside        | 1 Art               | 1 Ball/Object      | 1 Adult              | 1 Solitary   | 1 None         |
| 2 Limbs          | 2 Crawl         | 2 Outside       | 2 Books/Preacademic | 2 Fixed            | 2 Child              | 2 1-1 Adult  | 2 TP-I         |
| 3 Slow-Easy      | 3 Dance/Exp     | 3 Transition    | 3 Gross Motor       | 3 Game             | 3 Can't Tell         | 3 1-1 Peer   | 3 TP-D         |
| 4 Moderate       | 4 Jump/Skip     | 4 Can't Tell    | 4 Group Time        | 4 Open Space       | 99 ?                 | 4 Grp-Adult  | 4 PP-I         |
| 5 Fast           | 5 Lie Down      | 99 ?            | 5 Large Block       | 5 Pool             |                      | 5 Grp-Child  | 5 PP-D         |
| 6 Can't Tell     | 6 Pull/Push     |                 | 6 Manipulative      | 6 Portable         |                      | 6 Can't Tell | 6 Can't Tell   |
| 99 ?             | 7 R&T           |                 | 7 Music             | 7 Sandbox          |                      | 99 ?         | 99 ?           |
|                  | 8 Ride          |                 | 8 Nap               | 8 Snacks           |                      |              |                |
|                  | 9 Rock          |                 | 9 Self Care         | 9 SocioProps       |                      |              |                |
|                  | 10 Roll         |                 | 10 Snacks           | 10 TeacArranged    |                      |              |                |
|                  | 11 Run          |                 | 11 Sociodramatic    | 11 Time Out        |                      |              |                |
|                  | 12 Sit/Squat    |                 | 12 TeacArranged     | 12 Wheel           |                      |              |                |
|                  | 13 Stand        |                 | 13 Time Out         | 13 Other           |                      |              |                |
|                  | 14 Swim         |                 | 14 Transition       | 14 N/A             |                      |              |                |
|                  | 15 Swing        |                 | 15 Videos           | 15 Can't Tell      |                      |              |                |
|                  | 16 Throw        |                 | 16 Other            | 99 ?               |                      |              |                |
|                  | 17 Walk         |                 | 17 N/A              |                    |                      |              |                |
|                  | 18 Other        |                 | 18 Can't Tell       |                    |                      |              |                |
|                  | 19 Can't Tell   |                 | 99 ?                |                    |                      |              |                |
|                  | 99 ?            |                 |                     |                    |                      |              |                |

# Accelerometry



# Methods

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- 30 children between the ages of 3 and 5 from 3 local preschools
- Participants wore the COSMED K4b<sup>2</sup> indirect calorimetry system, 2 ActiGraph accelerometers, and 2 Actical accelerometers during all activities



# Accelerometer Placement



# Methods

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- ▣ Calibration: structured activities including rest, slow walk, brisk walk, and jog
- ▣ Cross-validation: Unstructured activities, free-play in the preschool classroom and on the playground



# Methods

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- Rest and structured activities
  - Laboratory setting
  - Rest: reclined position, watching a movie or cartoons
  - Structured: slow walk (2 mph), brisk walk (3 mph), jog (4 mph)

# Methods

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- Children were paced around the gym by a researcher for a period of 5 minutes at each speed
  - The children were encouraged to maintain the pace established by the researcher
  - Rest and small incentives were provided between each structured activity

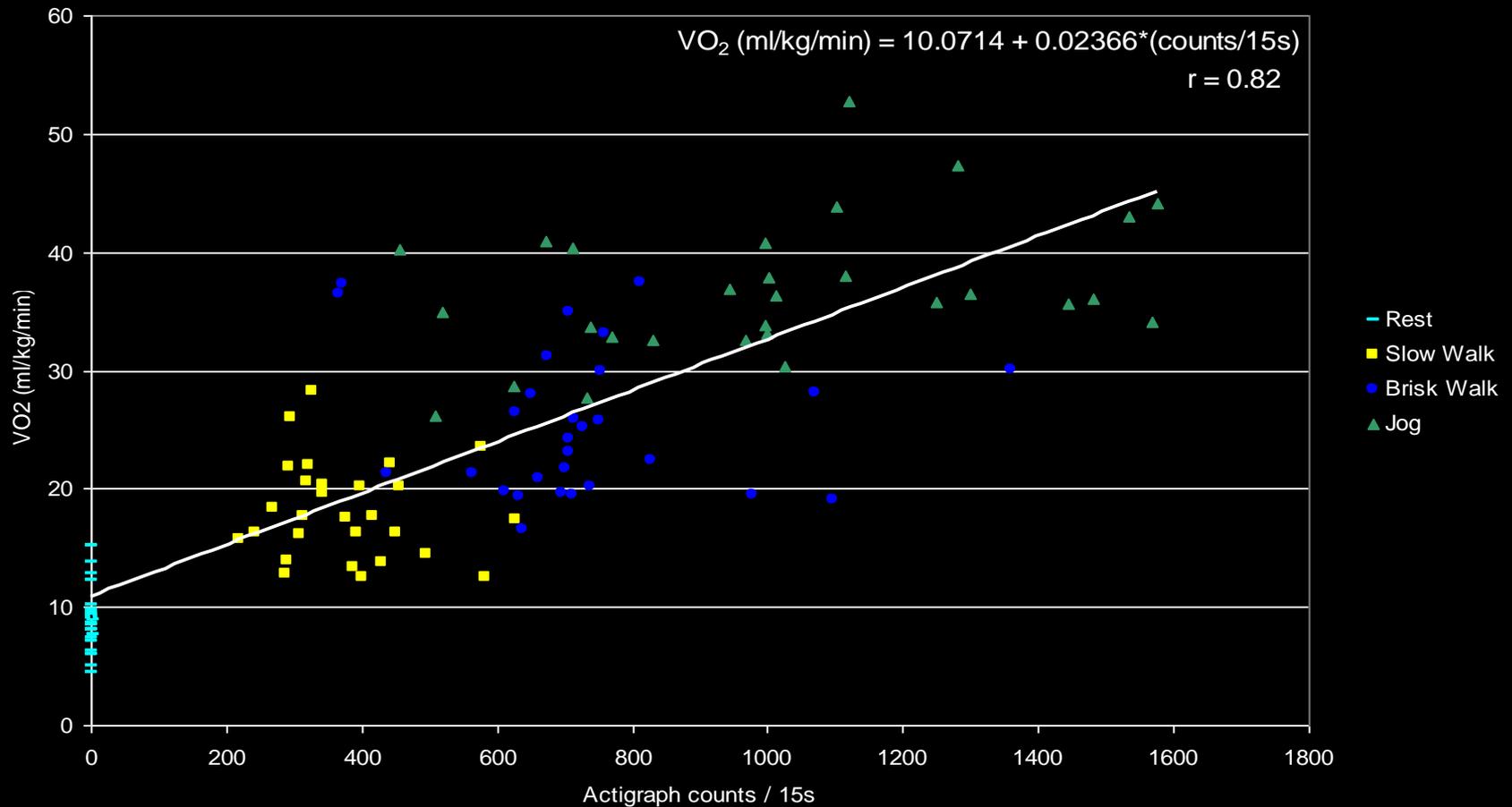
# Methods

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- Unstructured Activities
  - 20 minutes of play inside and outside at the preschool
  - Self-selected activities, encouraged to participate in a range of intensities



# Relationship between Actigraph counts and $\text{VO}_2$ (ml/kg/min)



# Directly-observed Physical Activity Levels in Preschool Children

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Pate RR, McIver KL, Dowda M, Brown WH.  
*Journal of School Health, 2008;78:438-444 .*

# Participants

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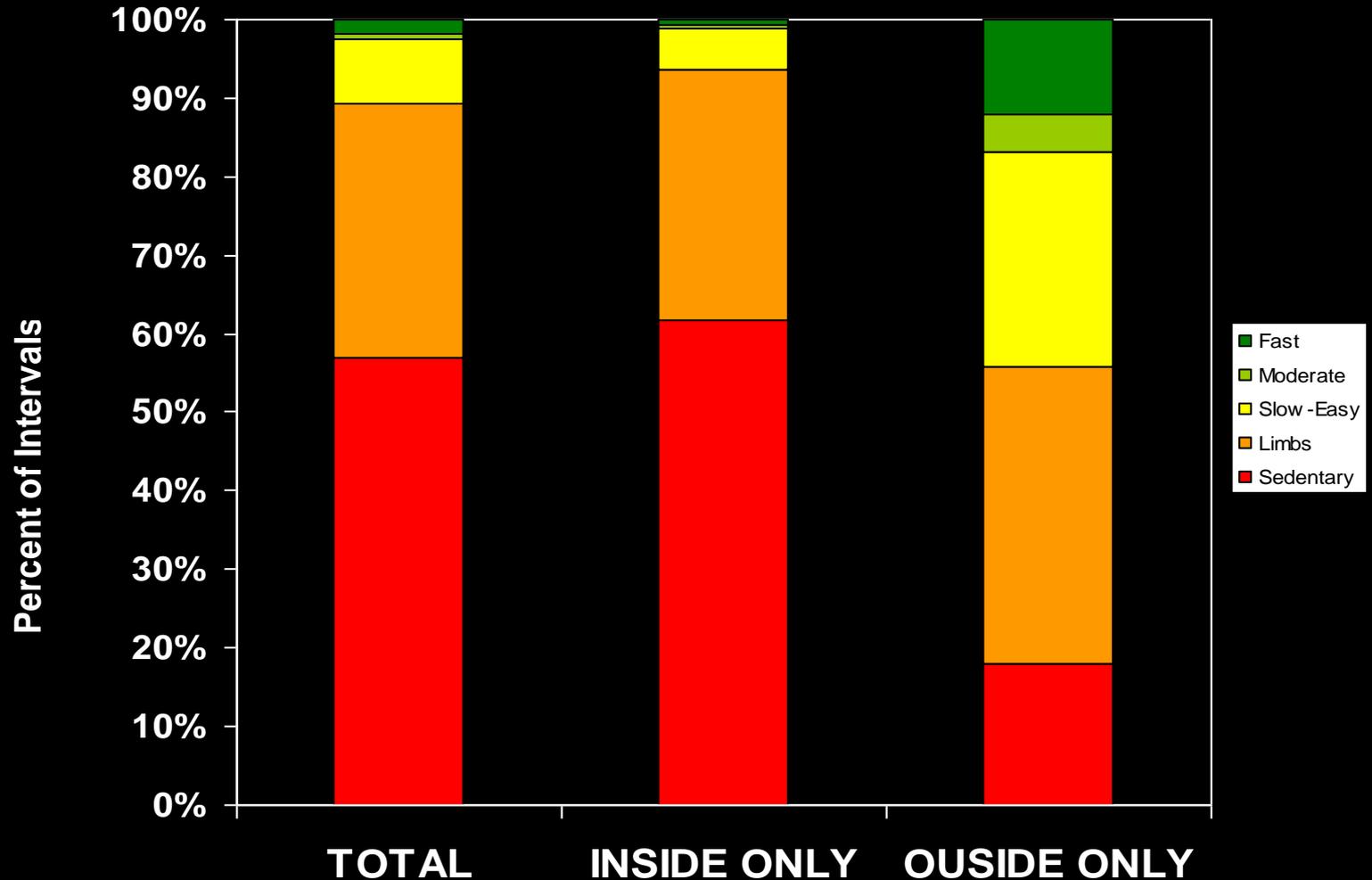
- 24 preschools in Columbia, SC
  - 12 Commercial
  - 8 Church-based
  - 4 Head Start Programs
- 2 rounds of data collection, separated by 13-19 months
- 438 children (50% male, 59% African American) had complete data

# Results

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- Percent of Intervals:
  - Sedentary 55.6%
  - Limbs 31.7%
  - Light Activity 8.1%
  - Moderate Activity 0.8%
  - Vigorous Activity 1.8%
  
- Preschoolers were observed in MVPA during **2.6%** of the intervals

# Physical Activity Levels of Preschoolers



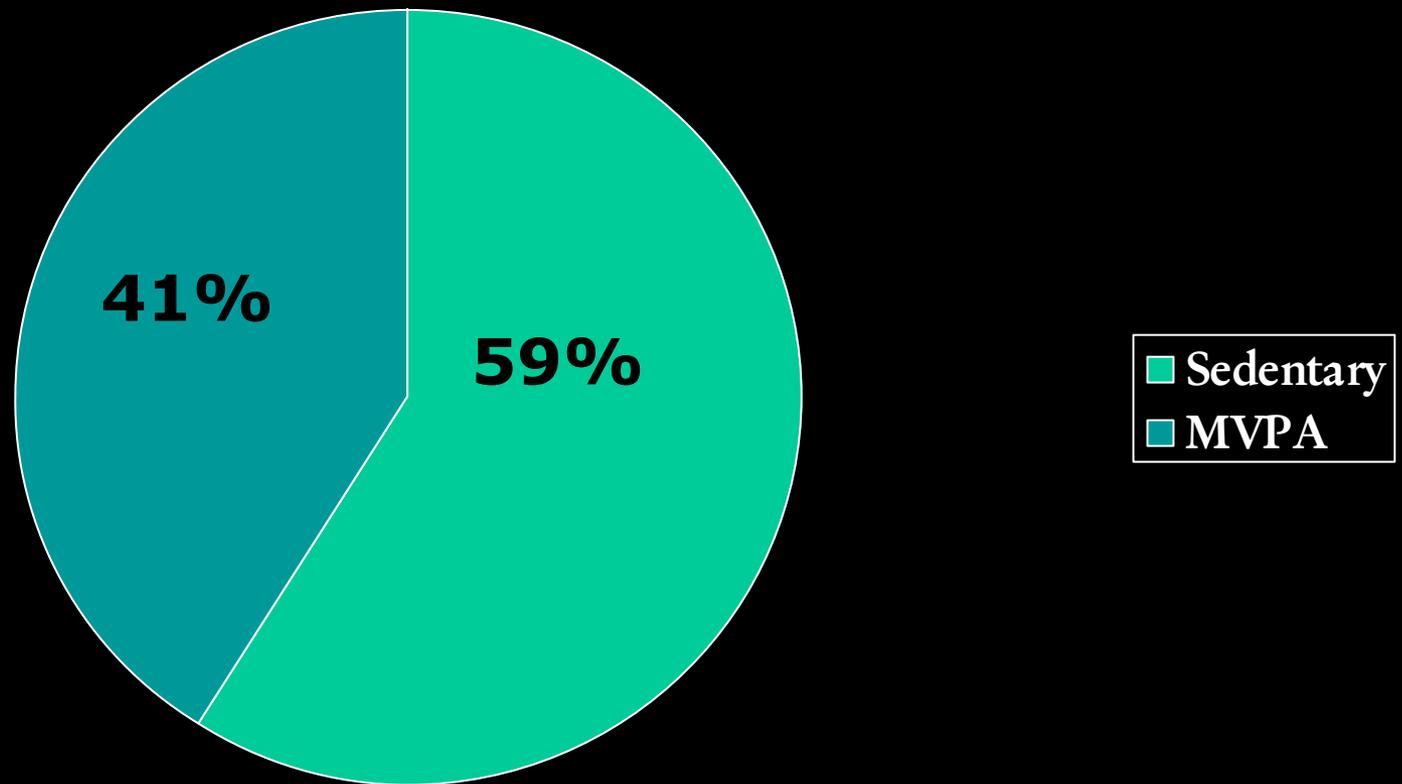
# Other Studies

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- ❑ Other researchers have used direct observation to assess PA levels of young children
  - McKenzie TL et al. *Res Q Exerc Sport* 1997;68:195-202.
  - Sallis JF et al. *J Dev Behav Pediatr* 1988;9:57-61.
  - Butcher JE & Eaton WO. *J Hum Mov Stud* 1989;16:27-36.

# PA levels & prompts in young children at recess: A 2-yr study of a bi-ethnic sample

**BEACHES; 256 preschoolers; 2 recess periods**



# Objectively Measured Physical Activity in Children During Preschool Attendance

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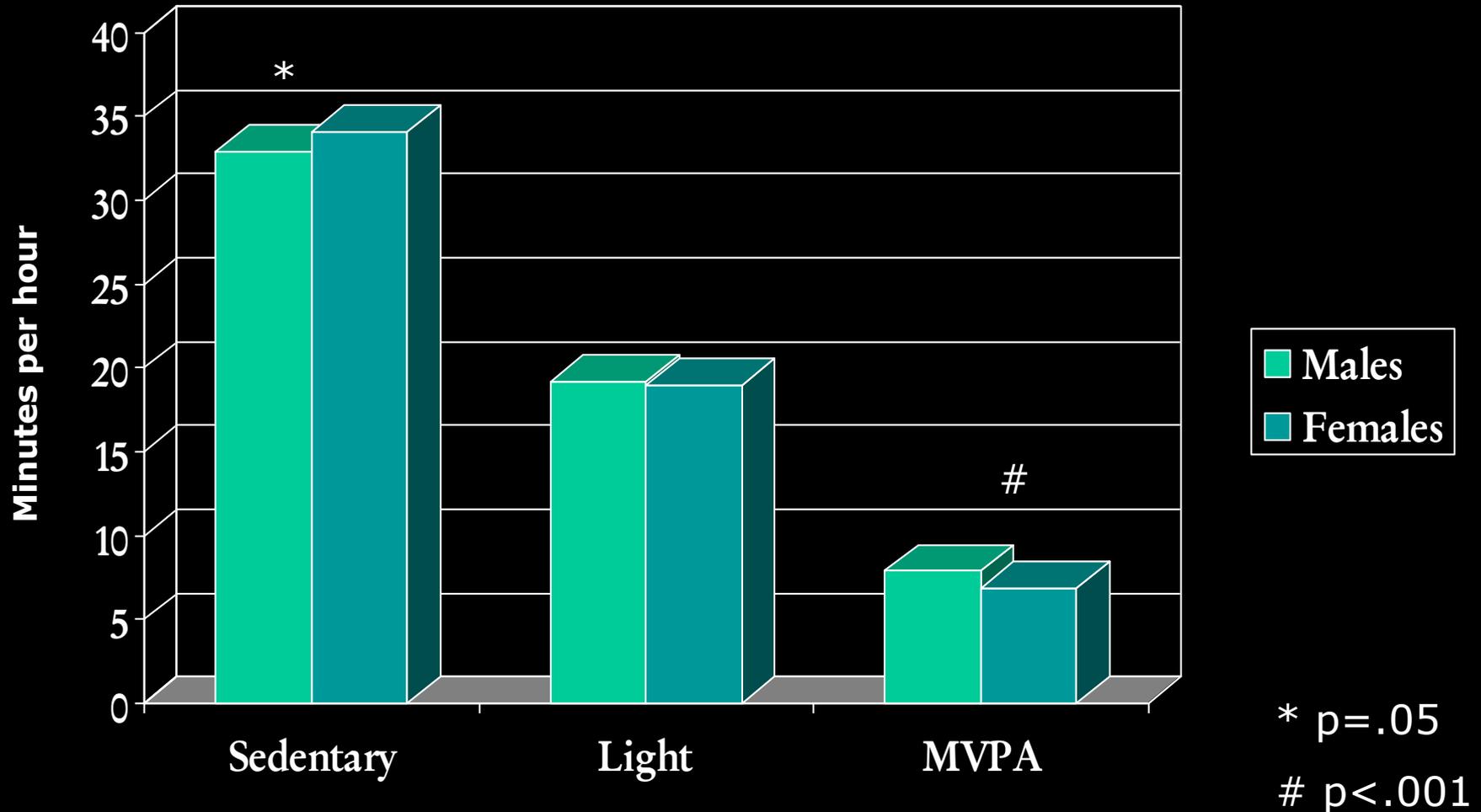
Pate RR, Dowda M, Pfeiffer KA, McIver KL,  
Addy C, Brown WH

# Participants & Methods

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- 20 preschools in Columbia, SC
  - Commercial, church-based, Head Start
  - 2 rounds of data collection, separated by 13-19 months
- 298 children (50% male, 49% African American)
- ActiGraph monitor for 5+ hours per day for 10 weekdays and 1 weekend
- 15-sec intervals
- Cutpoints established from calibration study
- Preschool arrival and departure times

# PA During the Preschool Day



# Other Studies

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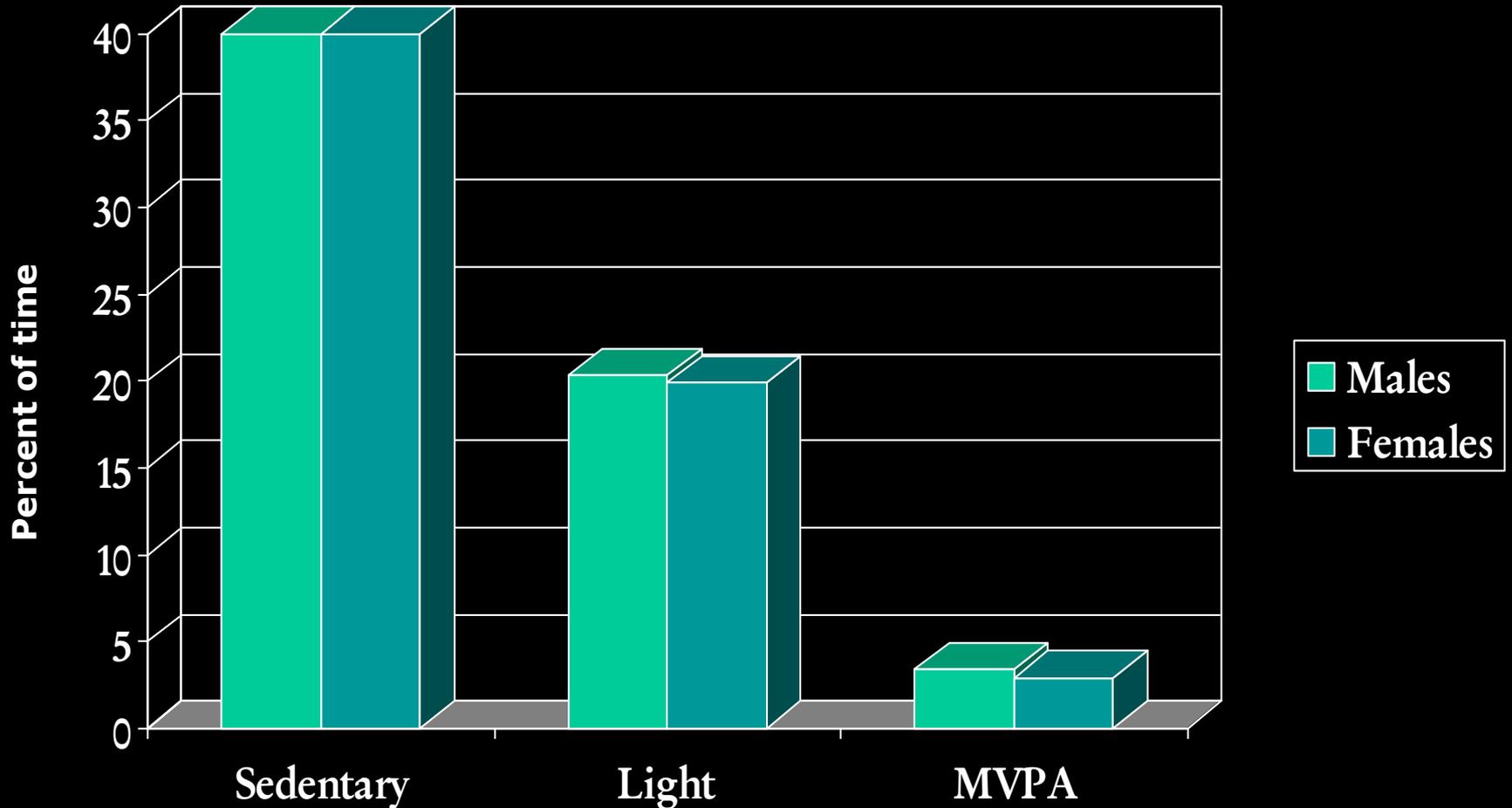
- Other researchers have used accelerometry to assess PA levels of young children
  - Kelly LA et al. Arch Dis Child 2006;91:35-38
  - Finn et al. J Pediatrics 2002;140:81-85
  - Fisher A et al. Med Sci Sports Exerc 2005;37;684-688

# Fundamental Movement Skills and Habitual PA in Young Children

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- 394 preschool children
- 53% male, mean age 4.2 years
- Accelerometers worn for 6 days
  - Sedentary cutpoint <1100 counts/minute (Reilly et al. 2003)
  - MVPA cutpoint >3299 counts/minute (Puyau et al. 2002).

# PA During the Preschool Day



Males less sedentary & more active than girls

# Policies and Characteristics of the Preschool Environment and Physical Activity of Young Children

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Dowda M, Brown WH, McIver KL, Pfeiffer KA,  
O'Neill, Addy CL, Pate RR.

*Pediatrics 2009;123;e261-e266*

# Participants & Methods

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- ❑ 299 children wore accelerometers for an average of 8.1 hours/day for 5.5 days during the preschool day.
- ❑ 20 Preschool directors were interviewed about preschool policies.
- ❑ A researcher completed the Early Childhood Environment Rating Scale-Revised for each preschool to quality.
- ❑ For each policy/characteristic, preschools were divided into 2 groups on the basis of whether the policy/characteristic was presumed to promote or not promote PA

# MVPA min/hour During the Preschool Day

