

# Factors Associated With Physical Activity in Kindergarten Children

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# Disclosure Slide

- Researcher: Carol L. Hammonds, PhD, RN, CNE
- Objectives: To disseminate research data of factors associated with physical activity in kindergarten children
- Author has no conflict of interest and did not receive any sponsorship or commercial support for this study

# Introduction

- 11,207,000 children in US attend preschool and kindergarten (Pate, O'Neill, & Mitchell, 2010; Pate, Pfeiffer, Trost, Ziegler, & Dowda, 2004; Pfeiffer, McIver, Dowda, Almeida, & Pate, 2006; S. M. Vale et al., 2010)
- 2011-2012 22.8% of children 2-5 years either overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014)
- Lack of physical activity (PA) and increase in sedentary behavior leads to obesity (Beets, Bornstein, Dowda, & Pate, 2011; Kimbro, Brooks-Gunn, & McLanahan, 2011; Moore, Nguyen, Rothman, Cupples, & Ellison, 1995)
- National Guidelines minimum of 60 minutes/day (Centers for Disease Control and Prevention, 2011)

# Aim 1a

To describe a) the patterns and duration of PA of kindergarten children at four different levels of intensity (sedentary (S), light (Lt), moderate-to-vigorous (MV), and vigorous (V) during a normal day in public kindergarten; and

# Aim 1b

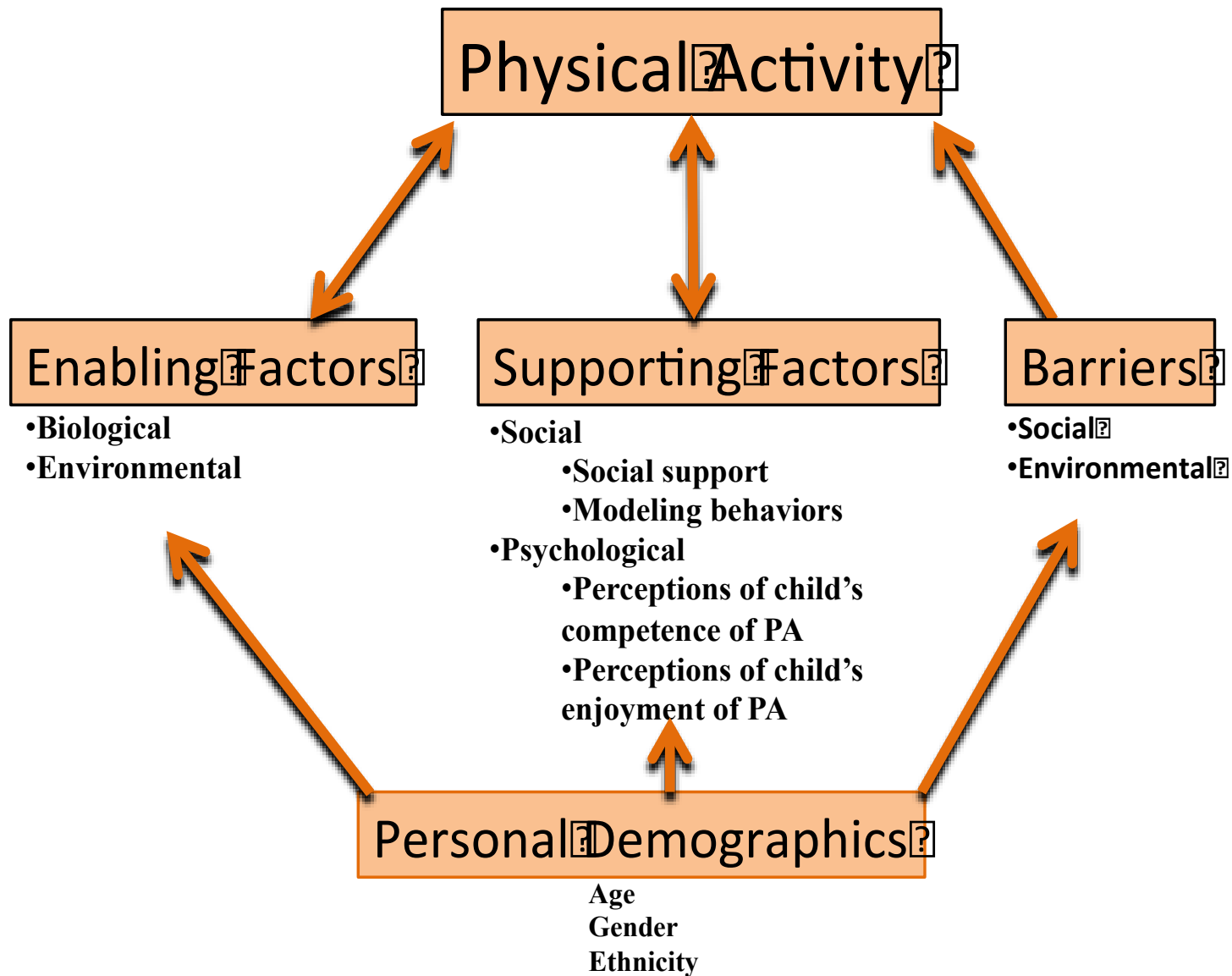
- To describe b) the factors that enable PA (body mass index (BMI), motor skills, and duration of access to play equipment), factors that support PA including social factors (mother social support by encouragement and mother and teacher behavior related to PA), and psychological factors (mother perceptions of child's competence and enjoyment of PA).

## Aim 2

- To identify the most predictive enabling and supporting factors associated with the duration of objectively measured moderate-to-vigorous and vigorous PA during the school day of kindergarten children while controlling for demographic factors (age, gender, and ethnicity).

# Background and Significance

- Previous research
- Observation vs. Accelerometers
- Theoretical Framework





# Methods and Designs

# Design

- Cross-sectional observational school-based study
- Objectively measured dependent variable, child's PA
  - Accelerometers
- Parent and Teacher Questionnaires and tools measured independent variables
  - Enabling
  - Supporting

# Setting and Sampling

- Kindergarten, full day public school
  - 5 classrooms from 1 elementary school in a district with 14 elementary schools
- Enrollment
  - Phone messaging
  - Questionnaire including consents
- Sample size

# Instruments

# Physical Activity

- Actigraph GTX3+ (Actigraph, Pensacola, FL)
- Validation (Pulsford et al., 2011; Van Cauwenberghe, Gubbels, De Bourdeaudhuij, & Cardon, 2011)

# Enabling Factors

## Biological

Variable	Tool	Scored
BMI	CDC Gender Specific Growth Charts	BMI
zBMI	CDC Gender Specific Weight for Stature z-scores	z-score (-2, -1.5, -1, -0.5, 0, 0.5, 1, 1.5, 2)
Motor Skills	Children's Motor Skill Tool	Locomotor and object control scores total (12 items repeated and added)

# Enabling Factors Environmental

Variable	Tool	Scored
Play time on Play equipment	Teacher Questionnaire	1 item from Teacher Questionnaire - Amount of time on play equipment min/day

# Supporting Factors

## Social

Mother Encouragement of active play	Mother Questionnaire (Cronbach alpha 0.79)	6 items from Mother Questionnaire - Likert scale 1-5 (reversed)
Mother PA time	Mother Questionnaire	1 item from Mother Questionnaire - Amount of time parent participates in PA
Teacher PA time	Teacher Questionnaire	1 item from Teacher Questionnaire - Amount of time teacher participated in PA

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# Supporting Factors

## Psychological

Variable	Tool	Scored
Perceptions of Competence	Mother Questionnaire	1 Items from Mother Questionnaire - (-1 Generally less Active, 0 Similarly Active, 1 Generally more Active and scored 0, less or similarly active and 1, more active)
Enjoyment of PA	Mother Questionnaire (Cronbach alpha 0.83)	2 items from Mother Questionnaire - Parents describe child enjoying PA (likert scale 1-5; scored 1-4 0 less enjoyment, and 5 as 1 more enjoyment)

# Data Collection Procedure and Analysis

# Data Analysis Plan

- Statistics
  - Aim 1 Description of PA
    - Duration of PA by intensity level
    - Patterns of PA by intensity level in 30-minute intervals
  - Aim 2 Predictive Factors
- Additional analysis

# Results

# Children's Characteristics

Factor	% (n)	Mean (SD)
Age		6.12 (0.14)
Ethnicity		
African American	92.1% (35)	
Hispanic	5.3% (2)	
White	2.6% (1)	
zBMI Mean (sd)		0.59 (1.06)
BMI Categories (Body Mass Index)		
Normal	63.2% (24)	
overweight	15.8% (6)	
Obese	15.8% (6)	

n number

SD Standard Deviation

# Percentage of School Day at Each Intensity Level of PA

Gender	S%	L%	MV%	V%
male	90.6	1.3	5.1	3
female	89	1.5	6.5	3
Total	89.7	1.4	5.9	3

S Sedentary

L Light

MV Moderate to Vigorous

V Vigorous

# 3-day Mean: Minutes of MV and V PA by Classrooms












































Classroom	n	Mean (CI)
1	9	31.2 (26.5-35.9)
2	9	32.6 (27.7-37.4)
3	11	23.5 (14.8-32.1)
4	6	44.0 (32.9-55.0)
5	3	44.7 (32.5-56.8)

n number

CI = 95% Confidence Interval



















































# Daily Percentage of PA at Different Levels of Intensity

Time	Total	Sedentary	Light	Mod to Vigorous	Vigorous
8:30 to 9:00:00 AM	94.9		0.9	3.2 	1.1 
9:00 to 9:30AM	94.3		0.9	3.8 	1.0 
9:30 to 10:00AM	95.3		0.9 	3.0 	0.8
10:00 to 10:30AM	88.7		1.2 	5.9 	4.2 
10:30 to 11:00AM	89.3		1.4 	5.4 	4.0 
11:00 to 11:30AM	93.9		1.1 	4.0 	0.9 
11:30 to 12:00PM	95.9		0.8	2.6 	0.7
12:00 to 12:30PM	94.5		1.0 	3.5 	1.0 
12:30 to 1:00PM	93.3		1.2 	4.2 	1.4 
1:00 to 1:30PM	85.2		1.5 	8.1 	5.2 
1:30 to 2:00PM	73.7		2.8 	14.7 	8.9 
2:00 to 2:30PM	82.8		2.2 	9.9 	5.1 

Mod = Moderate



# Daily Percentage of PA at Different Levels of Sedentary Intensity

Time	<37.5	37.5 to <200	200 to <373	Total Sedentary
8:30 to 9:00:00 AM	72.9 	16.4 	5.5 	94.9 
9:00 to 9:30AM	70.1 	18.2 	6.0 	94.3 
9:30 to 10:00AM	70.2 	19.1 	6.0 	95.3 
10:00 to 10:30AM	64.5 	17.0 	7.2 	88.7 
10:30 to 11:00AM	62.1 	19.9 	7.2 	89.3 
11:00 to 11:30AM	63.7 	23.1 	7.1 	93.9 
11:30 to 12:00PM	74.0 	16.9 	5.0 	95.9 
12:00 to 12:30PM	69.0 	19.1 	6.4 	94.5 
12:30 to 1:00PM	68.3 	18.1 	6.8 	93.3 
1:00 to 1:30PM	57.0 	19.6 	8.6 	85.2 
1:30 to 2:00PM	41.5 	20.1 	12.2 	73.7 
2:00 to 2:30PM	49.6 	21.7 	11.5 	82.8 

# Correlations Factors with the Dependent Variable

Variable	Pearson Correlation	Significance (2-tailed)
Motor Skills	-0.36	0.03
Teacher PA	-0.42	0.01

# Multiple Regression: Dependent Variable Minutes/Day MV and V PA Model 2

Variable	<i>B</i>	<i>SEB</i>	$\beta$	Sig.
(Constant)	70.12	14.24		0.00
Motor Skills Total	-0.22	0.12	-0.28	0.07
Teacher avg hr/day	-7.33	3.15	-0.36	0.02
$R^2 = 0.21$ $p = 0.01$				

# Additional Analysis

- Analysis of covariance
  - Classroom as factor
  - Test for significance of independent variables in predicting minutes of MV and V
- Results
  - 36% of variance in minutes of MV and V explained by this variable alone
  - No other predictors were significant after the differences among classrooms taken into account

# Discussion

# Discussion

- First to describe patterns and duration of kindergarten PA using accelerometer
- Main Findings
  - Amount of MV and V PA during school
  - Patterns of activity by intensity levels
  - Negative associations of factors
  - Lack of significance of predictor variables

# Amount of MV and V PA during school

- Half of recommended duration of MV and V PA
- Majority of time in sedentary PA
- Reasons to increase MV and V PA
  - Impact on cognitive skills (Sirota et al., 2013)
  - Academic behavior (Kozioł & Lutz, 2013)
  - Enhanced concentration (Kozioł & Lutz, 2013)

# Patterns of Activity by Intensity Levels

- When peaks occurred
  - Outside play
  - Inside guided play
- Opportunities for increased PA

(Carlson et al., 2013; Reznik, Wylie-Rosett, Kim, & Ozuah, 2013)



# Negative Associations of Factors

- Previous study (Williams et al., 2008)
- Negative for this study
- Speculation

# Lack of significance of predictor variables

- Wide variations among classrooms in the minutes of MV and V PA
- Only classroom effect was statistically significant

# Discussion

- Limitations
  - Limited sample size
  - Lack of ethnic/racial diversity in sample
  - Questionnaire limitation

# Discussion

- Strengths
  - Accelerometers
  - School environment
  - Theoretical base

# Conclusion

# Conclusions

- Limited amount of MV and V PA during the school day
- Further research into variation of PA among classrooms
- Need for replication with larger more diverse sample of kindergarten children
- Further development of a more culturally and linguistically appropriate tool with consistency in the format of the questions is recommended.

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