Observation of dynamic child development setting systems and behavioral outcomes

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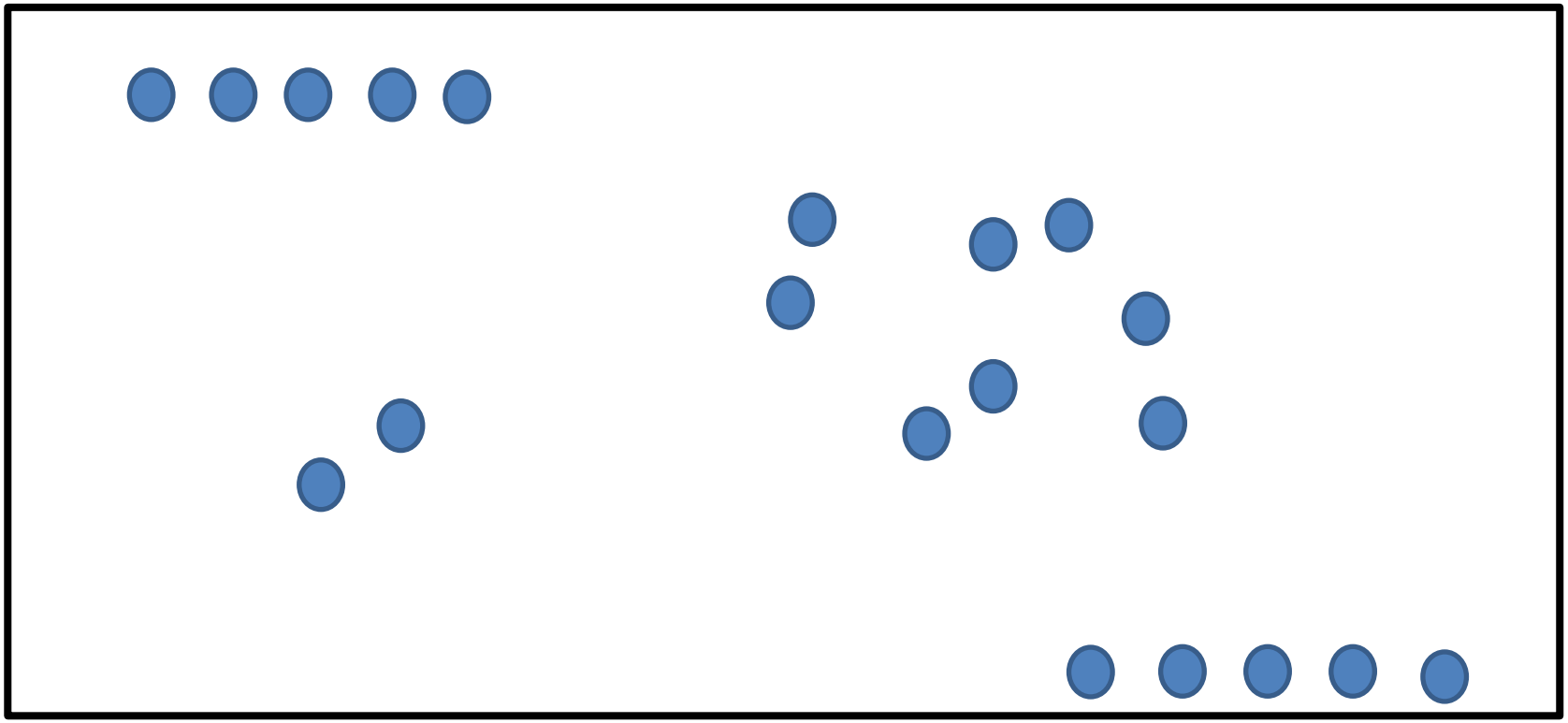
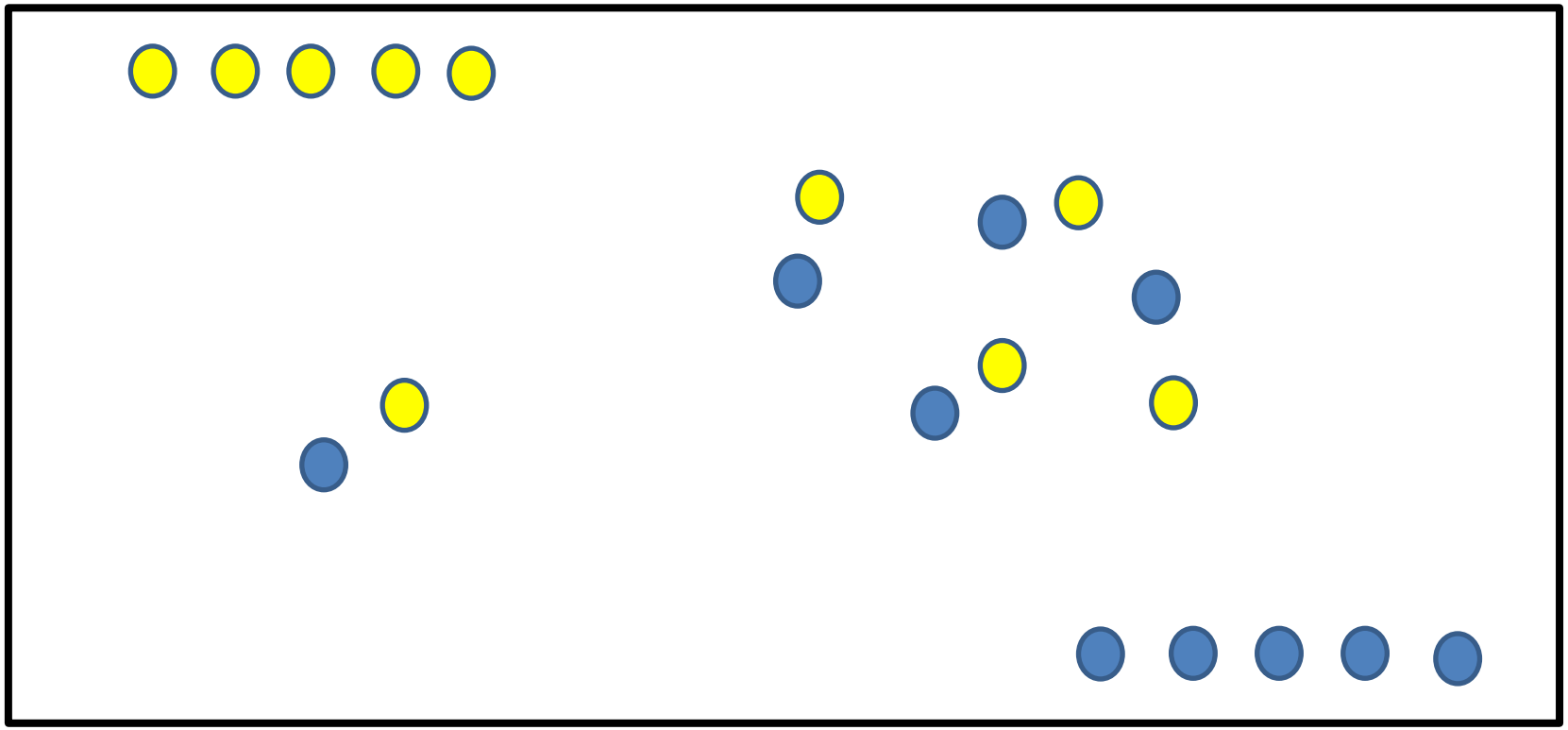
Agenda

- Observing dynamic social systems
- Physical activity outcome example
  - Girl Scouts
  - Preschool Centers
  - Youth Sport
- Summary

Local Area Practices



Local Area Practices



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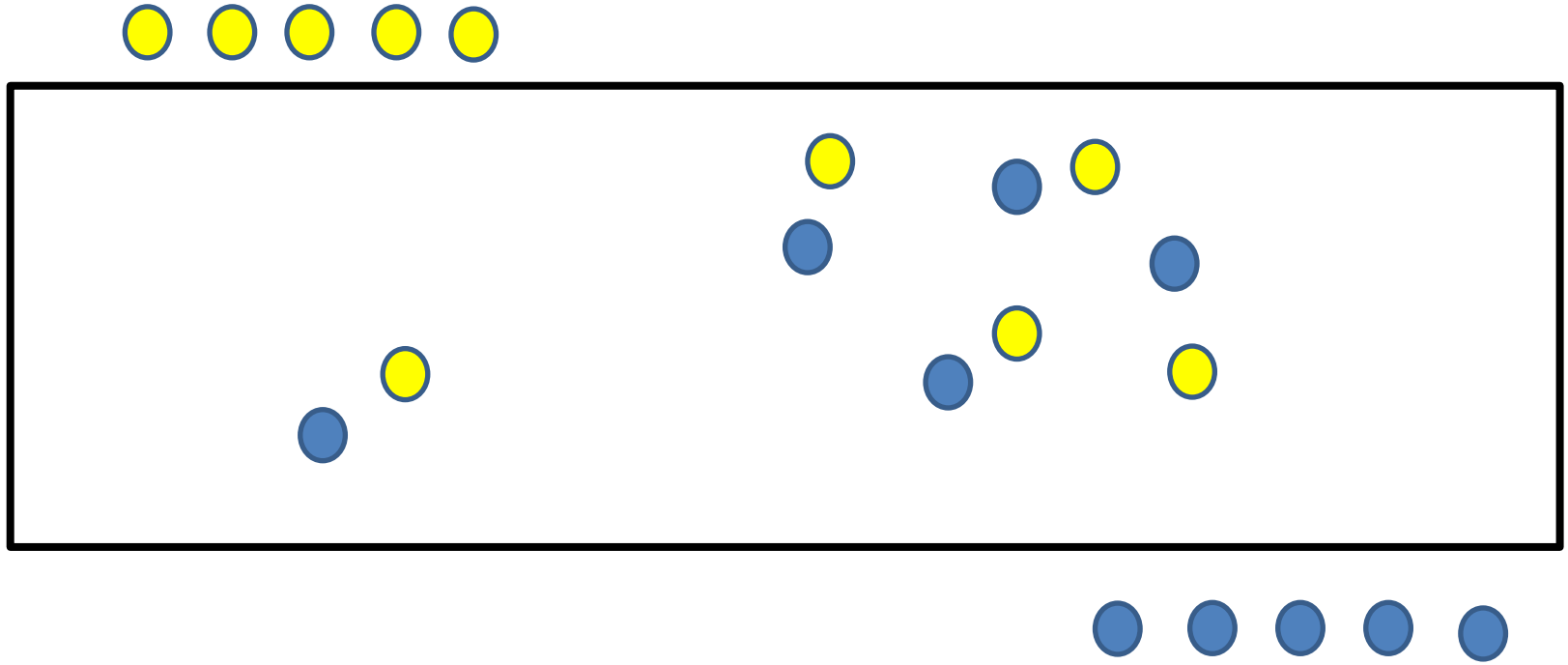
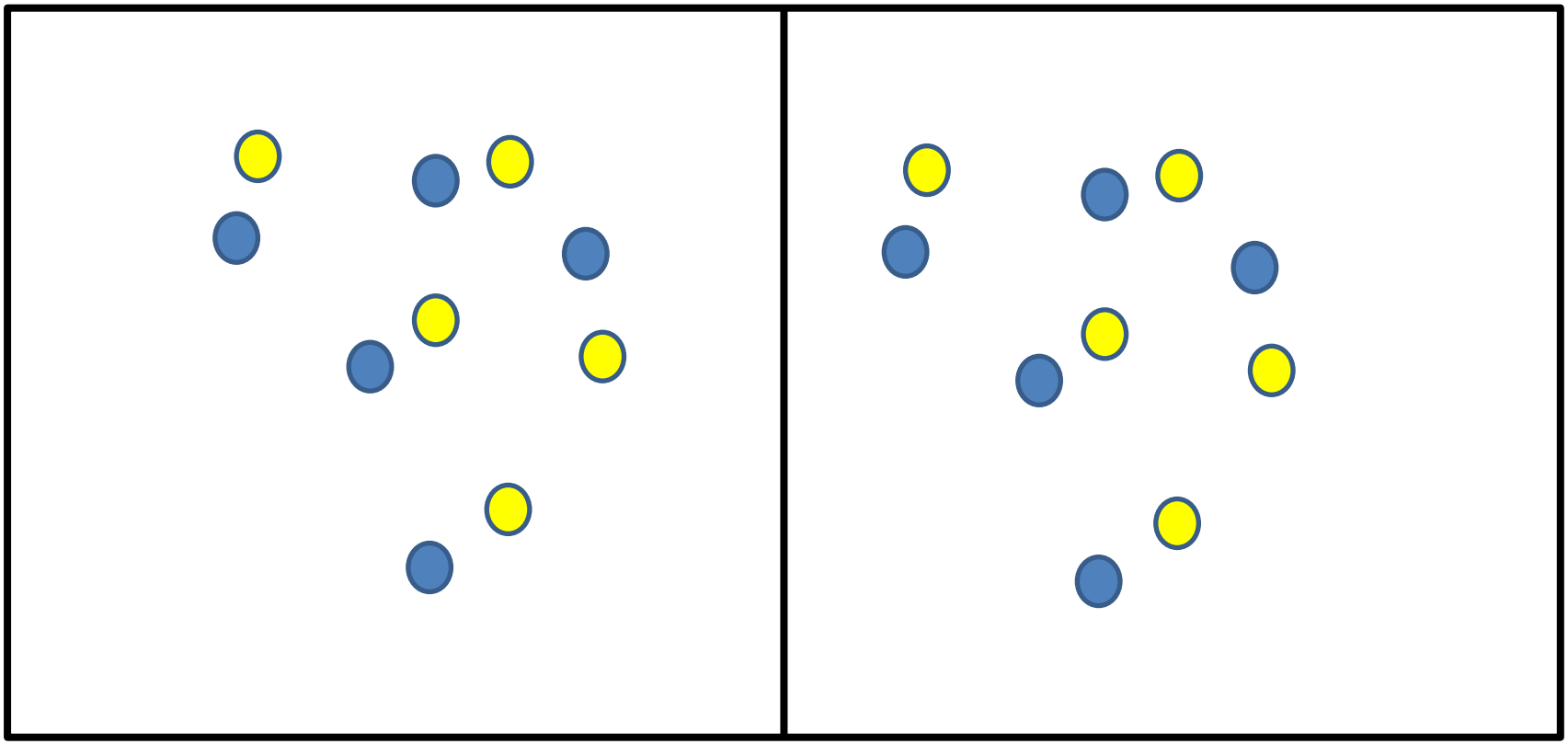


Local Area Practices



Observation Systems

Following Individuals

- Homogeneity
- Aggregation
  - Addition of Independent Main Effects
- Time Invariance

Following System Routines

- Heterogeneity
- Emergence
  - Interaction
  - Gestalt
- Time Dynamic

A Community Wellness Landscape

- Community population health and development for children is the result of children interacting with dynamic places where they live, learn, and play across a geographic area.

- In order to foster communities that are more conducive for population health and development, there is a need to identify local social system drivers within diverse places over time.

Purpose

- To understand the drivers of children's physical activity (PA) during youth setting time.

Why Physical Activity?

Nebraska

2- to 4-year-old WIC participants

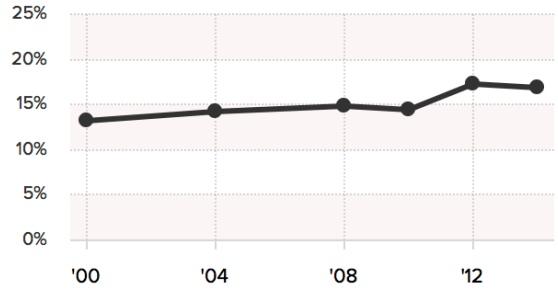
Current obesity rate (2014)

16.9%

Rank among states (2014)

5/51

Historical rates (2000-2014)



Source: stateofobesity.org/wic

Obesity-Related Cancer

Obesity-related cancer cases in 2010

29,132

Projected cases of cancer in 2030

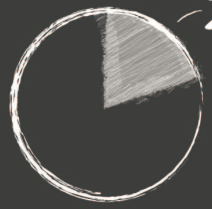
68,288

active kids learn better

ACTIVE LIVING RESEARCH

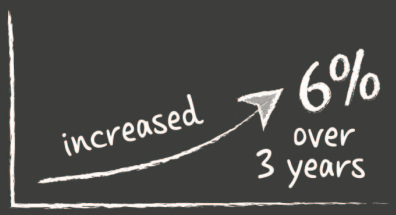
physical activity at school is a win-win for students and teachers

GRADES:



20% more likely to earn an A in math or English

STANDARDIZED TEST SCORES:



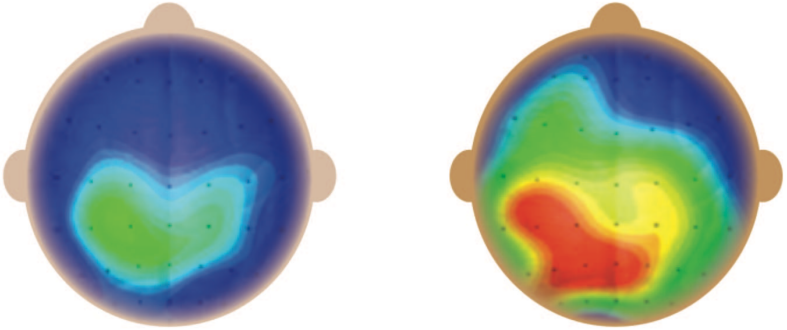
JUST ONE PHYSICALLY ACTIVE LESSON CREATES:

13% increase in students' physical activity for the week

21% decrease in teachers' time managing behavior

physically active kids have more active brains

BRAIN SCANS OF STUDENTS TAKING A TEST:



after 20 minutes of sitting quietly

after 20 minutes of walking

Red areas are very active; blue areas are least active.

MORE RESULTS:

after 20 minutes of physical activity:

students tested better in reading, spelling & math and were more likely to read above their grade level

after being in a physically active afterschool program for 9 months:

memory tasks improved 16%

SOURCES: Donnelly J.E. and Lambourne K. (2011). Classroom-based physical activity, cognition, and academic achievement. Prev Med. 52(Suppl 1):S36-S42. Hillman C.H. et al. (2009). The effect of acute treadmill walking on cognitive control and academic achievement in preadolescent children. Neuroscience. 159(3):1044-1054. Kamijo K. et al. (2011). The effects of an afterschool physical activity program on working memory in preadolescent children. Dev Sci. 14(5):1046-1058. Kibbe D.L. et al. (2011). Ten years of TAKE 10!: integrating physical activity with academic concepts in elementary school classrooms. Prev Med. 52(Suppl 1):S43-S50. Nelson M.C. and Gordon-Larson P. (2006). Physical activity and sedentary behavior patterns are associated with selected adolescent health risk behaviors. Pediatrics, 117(4): 1281–1290.

Learn more about why active kids learn better and how schools can help at activelivingresearch.org/activeeducationbrief

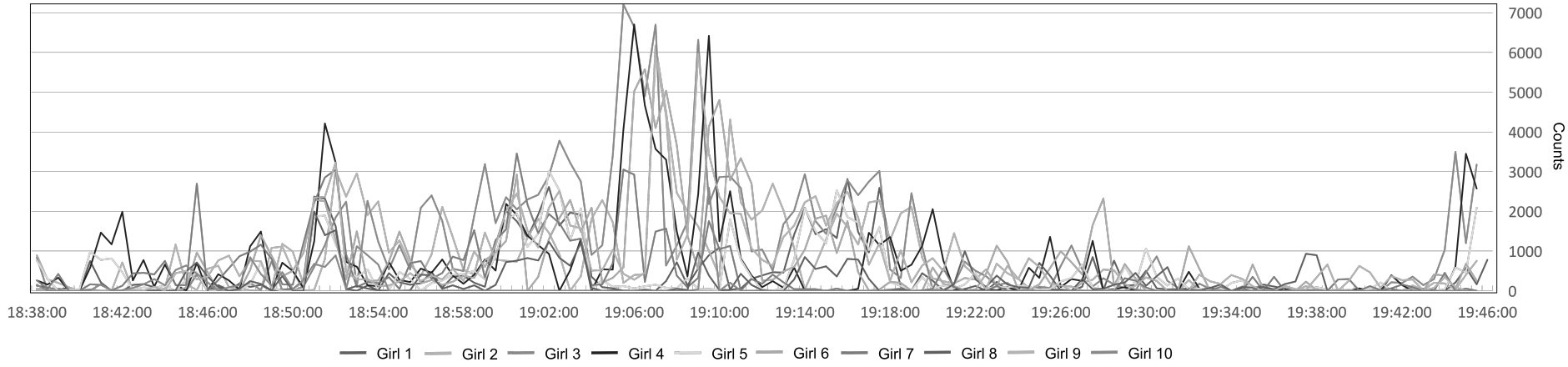
Child Development Settings

- Early Childhood Center
- Scouting
- Youth Sport

Observing Drivers of PA

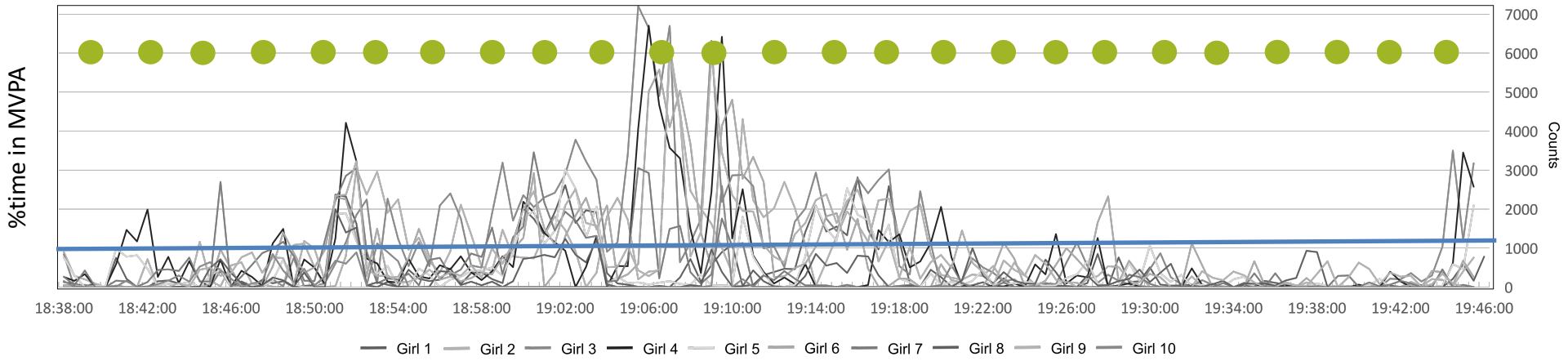
Observing drivers of PA

- Patterns of variability in PA *within* setting time



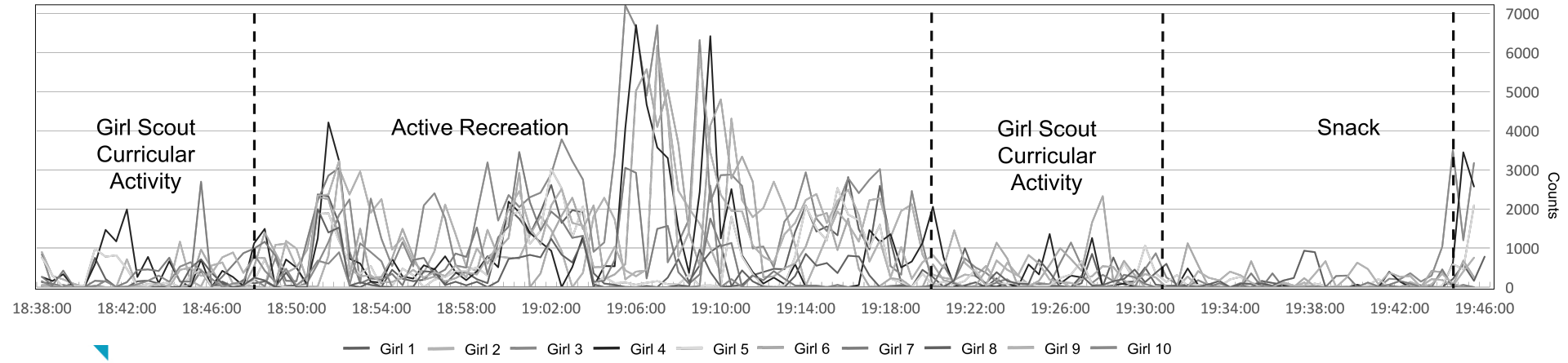
Observing drivers of PA

- PA typically reported as total setting time (e.g., percent of MVPA in total girl scout troop meeting)

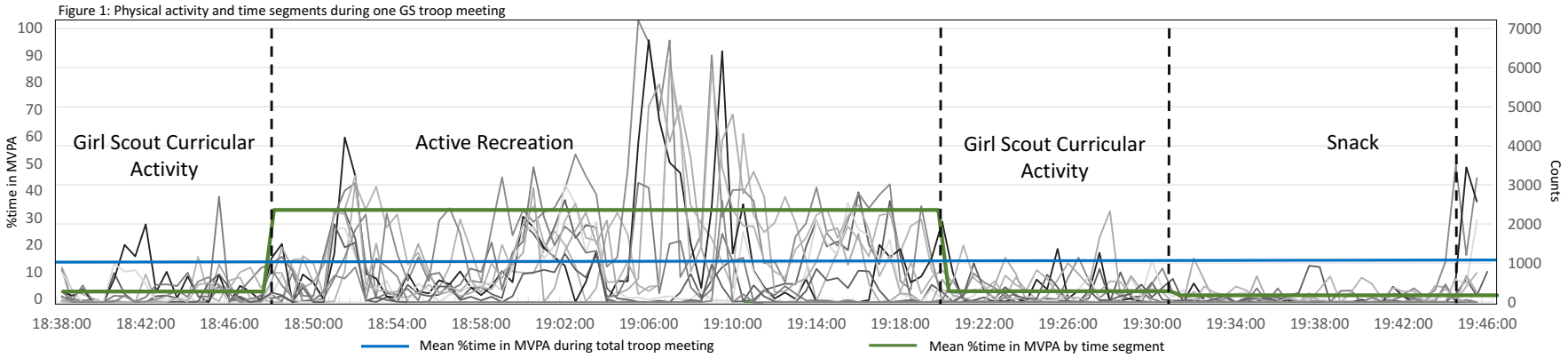


Observing drivers of PA

- Divide time into segments using continuous sampling



Observing drivers of PA



Schlechter, C. R., Rosenkranz, R. R., & Dzewaltowski, D. A. (2017). Girl Scout Troop Meeting Time-segmented Patterns Of Physical Activity Driven By Task.: 3145 Board# 50 June 2 3. *Medicine & Science in Sports & Exercise*, *49*(5S), 888..

Observing drivers of PA: Girl Scouts

Table 1: Segment characteristics

Segment	Frequency % (n)	Frequency Number per meeting	Mean segment length in minutes Mean ± SD (range)	Percentage of time mean (95% CI)		
(n = 181)					/PA	Vigorous
Overall						
Opening/closing	29.83 (54)	1.11	12.51 ± 16.62 (1.00–75.00)	46.79 (36.60–56.98)	3.96 (0.54–7.38)	0.90 (0.00–3.53)
Intervention	14.60 (13)	0.62	[illegible]	[illegible]	[illegible].20)	0.62 (0.00–3.53)
Control	[illegible]	46	[illegible]	[illegible]	[illegible].15)	1.19 (0.00–3.87)
Overall						
Active Recreation	[illegible]	[illegible]	17.58 ± 9.21 (2.00–32.00)	24.97 (13.94–36.00)	10.99 (7.16–14.82)	3.57 (0.75–6.34)
Intervention	[illegible]	86	[illegible]	[illegible]	21.02 (17.30–24.74)	5.84 (3.04–8.64)
Control	.05 (5)	0.18	[illegible]	[illegible]	0.95 (0.00–6.26)	1.30 (0.00–4.83)
Overall						
Snack	22.65 (41)	0.84	[illegible]	[illegible]	0.74 (0.00–4.10)	0.52 (0.00–3.12)
Intervention	23.60 (21)	1.00	[illegible]	[illegible]	[illegible]84 (0.00–4.45)	0.32 (0.00–3.06)
Control	21.74 (20)	0.71	[illegible]	[illegible]	[illegible]39 (0.00–5.09)	0.72 (0.00–3.50)
Overall						
GSCA	34.81 (63)	1.29	28.88 ± 21.82 (5.00–123.70)	61.88 (51.91–71.83)	0.73 (0.00–4.04)	0.68 (0.00–3.25)
Intervention	41.57 (37)	1.76	20.12 ± 15.13 (5.00–85.00)	63.47 (51.16–75.78)	1.14 (0.00–4.65)	0.56 (0.00–3.06)
Control	28.26 (26)	0.93	40.86 ± 24.27 (5.00–123.70)	60.30 (48.59–72.00)	0.31 (0.00–3.94)	0.80 (0.00–3.54)

GSCA=Girl Scout Curricular Activities; MVPA=moderate-to-vigorous physical activity

3.96 (0.54–7.38)

10.99 (7.16–14.82)

0.86

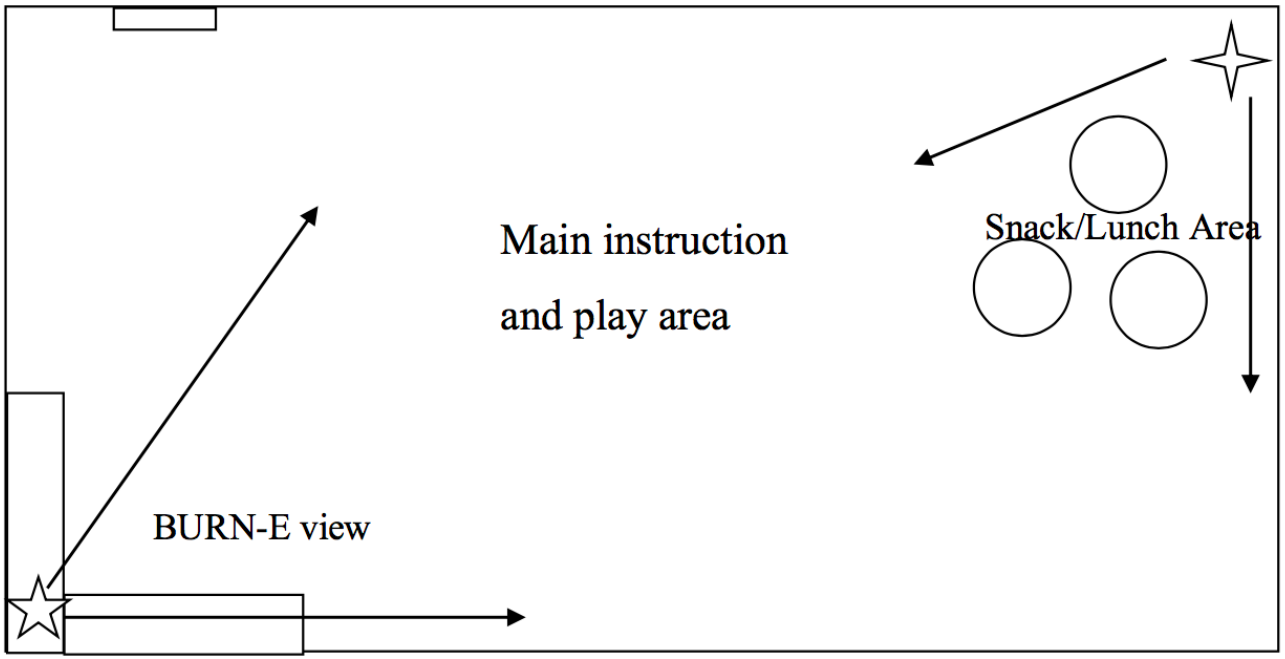
0.18

0.74 (0.00–4.10)

0.73 (0.00–4.04)

Observing drivers of PA: Preschool

- 8 preschool classrooms from 2 preschool centers
- 15 total observation days
- 73 children (age range 3-6)



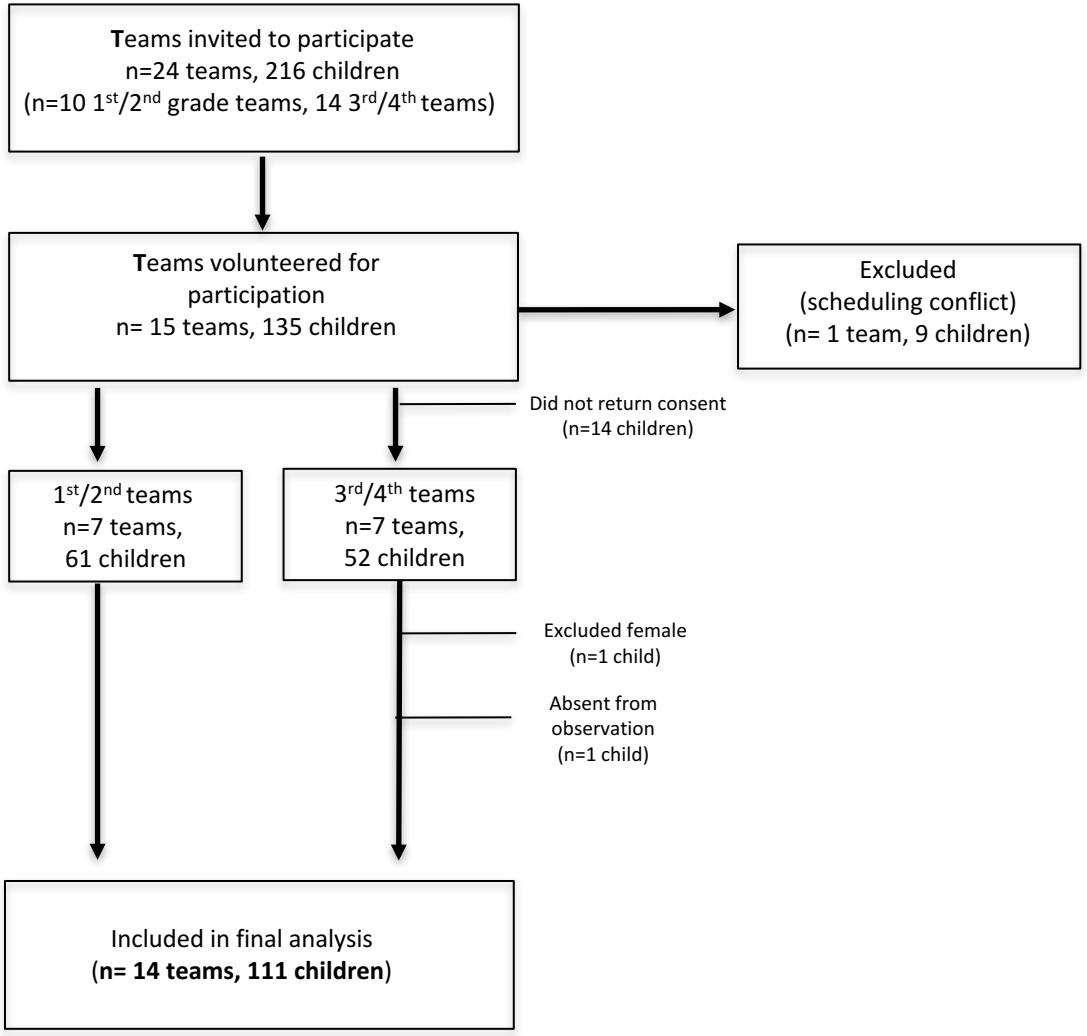
Observing drivers of PA: Preschool

	Percentage of time, mean (95% CI)			
	Sedentary/inactive		TPA	
Total	69.50	(56.64–76.06)	30.50	(17.64–37.06)
Location				
Indoor	81.85	(75.93–84.87)	18.16	(12.20–21.20)
Outdoor	65.02	(58.61–68.29)	34.82	(28.39–38.10)
Time				
Morning	72.93	(66.74–76.09)	27.07	(20.94–30.17)
Afternoon	73.18	(66.71–76.48)	26.82	(20.35–30.12)
Time x Location				
Morning outdoor	63.35	(56.29–66.95)	36.36	(7.13–29.23)
Afternoon outdoor	66.52	(59.64–70.03)	33.46	(6.90–26.56)
Morning Indoor	82.16	(76.20–85.2)	15.64	(9.68–18.68)
Afternoon Indoor	66.52	(59.46–70.12)	20.09	(12.45–23.99
Pattern				
Small group	78.23	(70.92–81.96)	21.77	(14.46–25.5)
Whole group	87.98	(81.74–91.16)	12.02	(5.79–15.2)
Activity Centers	84.84	(77.79–88.44)	12.31	(5.67–15.7)

Schlechter, C. R., Rosenkranz, R. R., Fees, B. S., & Dzewaltowski, D. A. (2017). Preschool daily patterns of physical activity driven by location and social context. *Journal of school health*, *87*(3), 194-199.

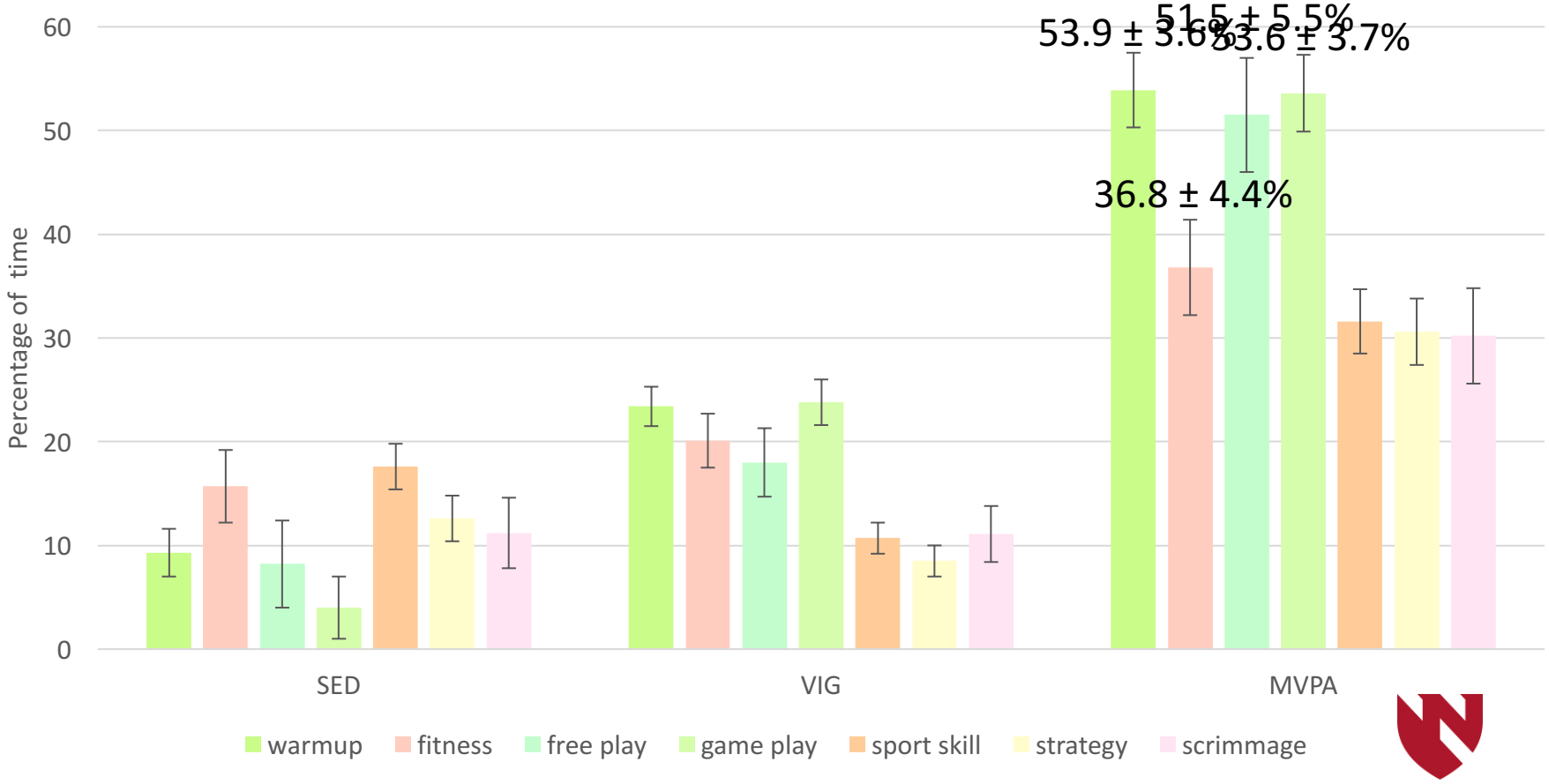
Observing drivers of PA: Youth Sport

- Typically 30-50% of youth sport time spent in MVPA (Schlechter et al.,2016; Leek et al.2013)



Observing drivers of PA: Youth Sport

- Practice time averaged (±SE) 61 ± 8.6 minutes with 34 ± 2.4% of time spent in MVPA.



Schlechter, C. R., Guagliano, J. M., Rosenkranz, R. R., Milliken, G. A., & Dzewaltowski, D. A. (2018). Physical activity patterns across time-segmented youth sport flag football practice. *BMC public health*, *18*(1), 226.

Observing drivers of PA: Youth Sport

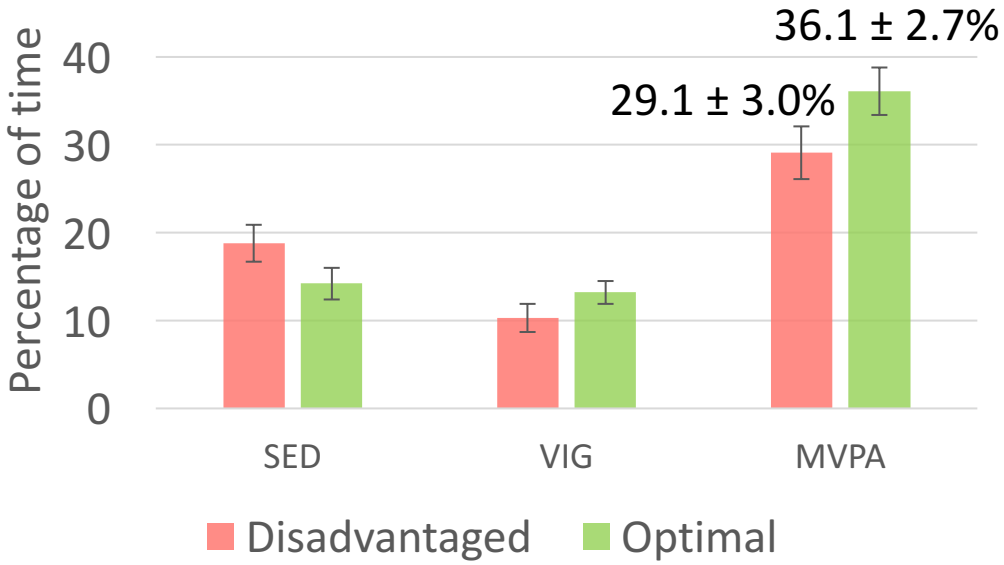
Principle of Demand

Optimal

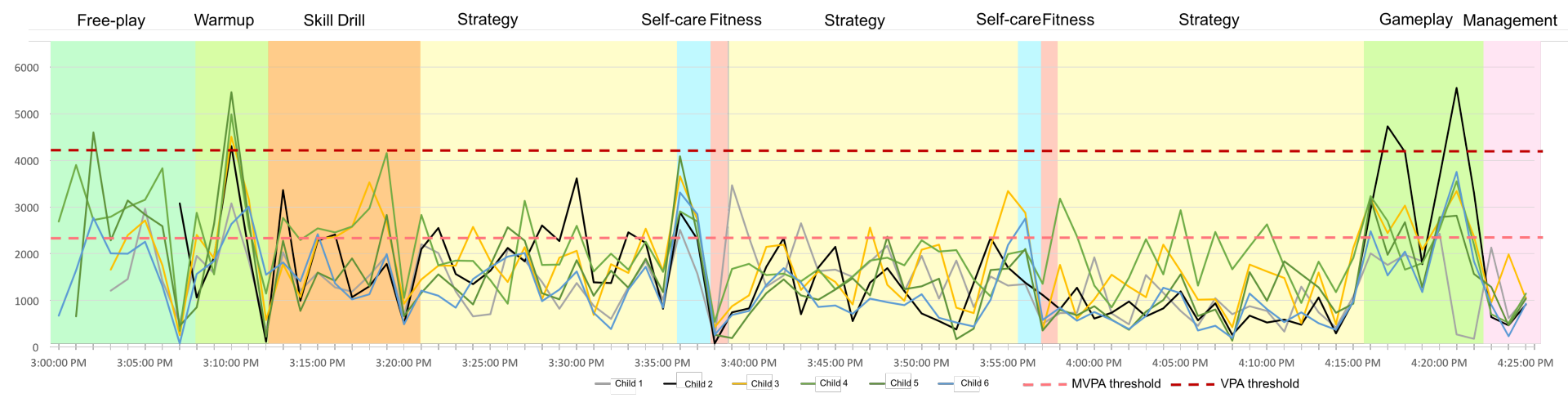
- Equal number of opportunities to participate as children to participate

Disadvantaged

- Fewer number of opportunities to participate than children available to participate



Observing drivers of PA: Youth Sport



Summary

- *What information resulted from this investigation?*
    - The daily routines of diverse child development settings (e.g., child care, scouting, youth sport) can be segmented into time periods and the time periods can be characterized by contextual variables.
    - Social contexts drive child population behavioral outcomes.
- *What are the key take-away points?*
    - The typology of time segments in the daily routines of settings is highly variable, which results in dynamic physical activity outcomes.
- *How can information from this study inform or advance early childhood practice?*
    - Practitioners should structure setting routines to include time segments conducive to physical activity.
- *How can information from this study inform or advance early childhood public policy?*
    - Policy making should be informed by an understanding that is is a driver within a dynamic social system.
- *How can lessons from practice and policy inform this line of research?*
    - *Practitioners have struggled with implementing PA policies into their daily routines.*
    - *Policies have focused on individual rather than social system processes.*