SERVING UNDERSERVED CHILDREN

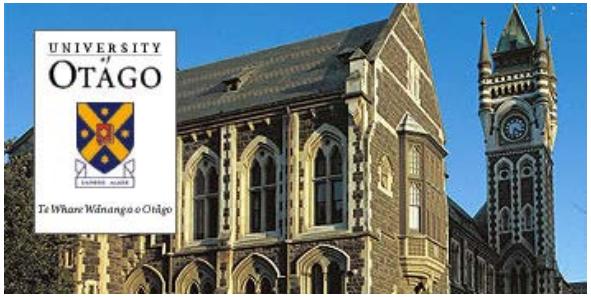
Scalable solutions to prevention obesity and promote emotional well-being in families

Kirsten Davison, PhD

Alice Hamilton Award Lecture

Departments: Nutrition and Social Behavioral Sciences

World Tour of Mentors



PENNSTATE

1855

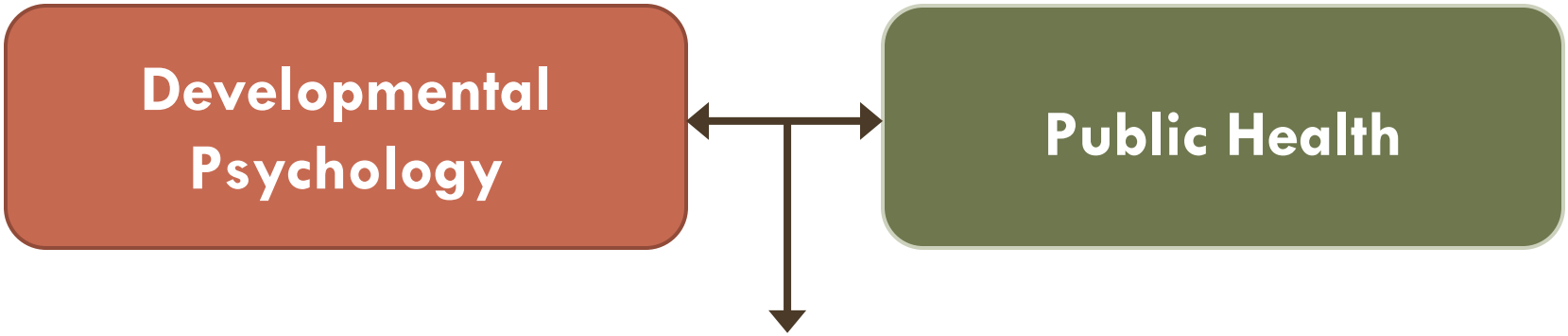
VE RI TAS

HARVARD T.H. CHAN SCHOOL OF PUBLIC HEALTH

Overview

1. Research Areas
2. Research Philosophy and Approach
3. Example 1: Exercise and mental health
4. Example 2: Family-focused obesity prevention

Research Areas



1. Parenting effects on children's health behaviors

- Physical activity; Snacking; Sleep
- Fathers and childhood obesity prevention

Research Areas

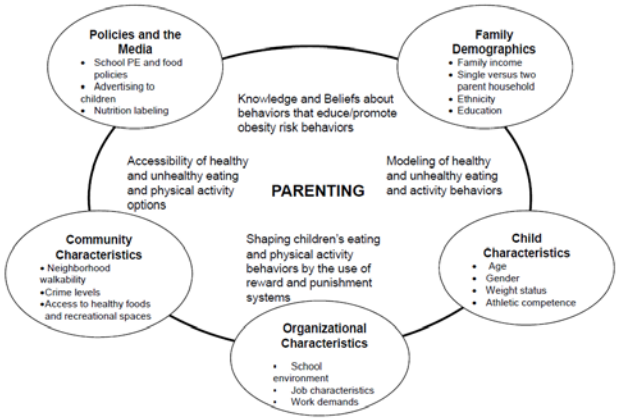
2. Family and community interventions to prevent obesity in children

- WIC
- Head Start
- Special education programs

COMMUNITIES FOR HEALTHY LIVING

3. Research tools

- Conceptual models
- Parent- and child-report surveys



Research Philosophy

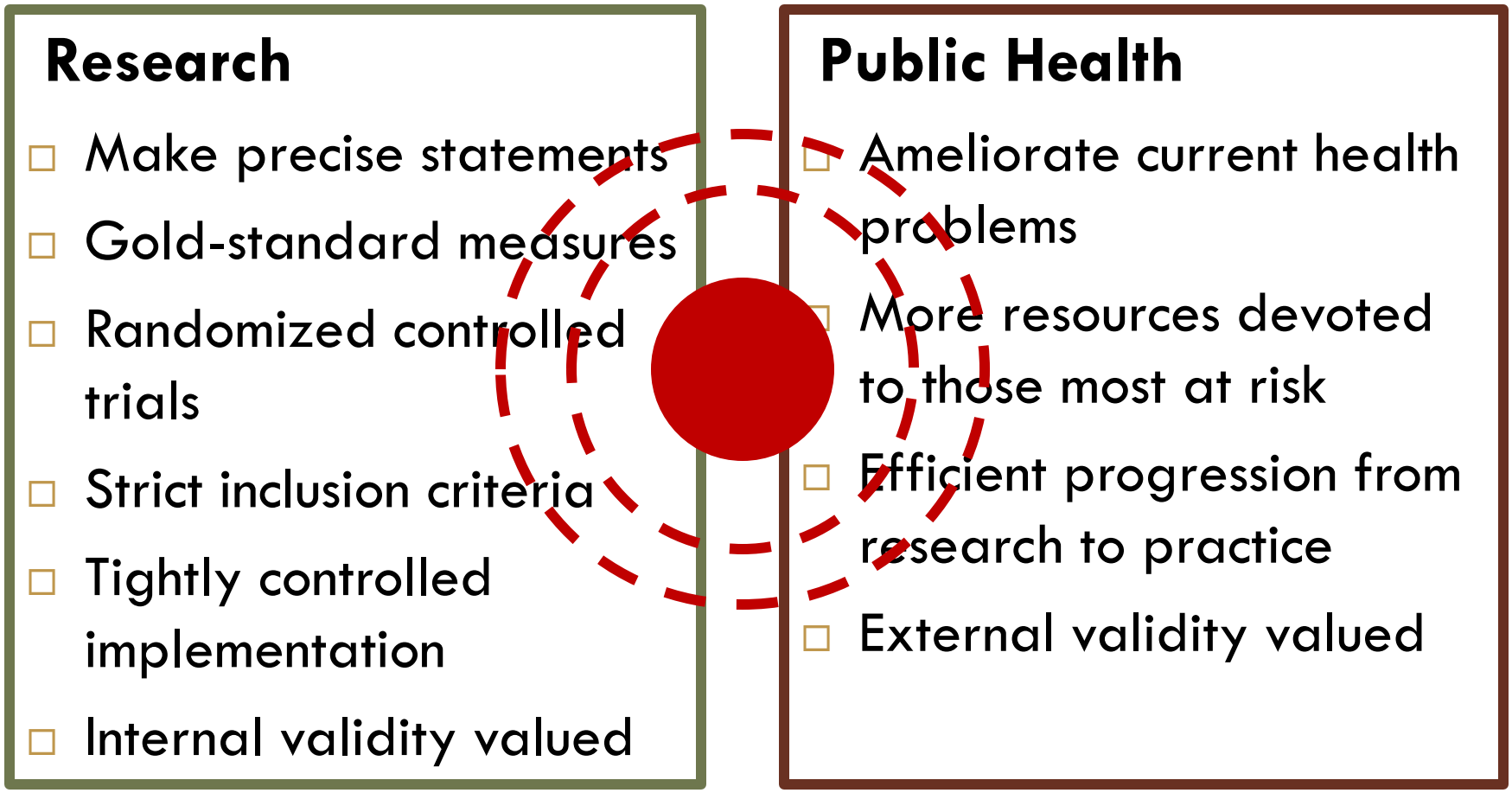
Research

- Make precise statements
- Gold-standard measures
- Randomized controlled trials
- Strict inclusion criteria
- Tightly controlled implementation
- Internal validity valued

Public Health

- Ameliorate current health problems
- More resources devoted to those most at risk
- Efficient progression from research to practice
- External validity valued

Research Philosophy



Approach

1. Collaborate with the end-user
   - Community Based Participatory Research (CBPR)

Approach

1. Collaborate with the end-user
   - Community Based Participatory Research (CBPR)

2. Research under real world circumstances
   - Building interventions into systems of care
   - Drawing on implementation science
   - Utilizing pragmatic trials (practical behavioral trials)

Manville Moves

Exercise intervention to promote self-regulation in children with social and emotional disabilities.

Manville Moves




RESEARCH TEAM

Harvard School of Public Health

Sebastien Haneuse, Assoc. Professor
April Bowling, ScD
Richard Kow, MPH
Sami Newlan, Doctoral student
Jeanette Garcia, Postdoctoral fellow

Boston University

Daniel Miller, Assistant Professor

The Manville School

Jamie Slavet, Clinical Coordinator
James Prince, Director
Robert Hermesch, Milleu Director
Brian Wood, PE Director
Amanda Hayes, School psychologist

Self Regulation

Definition: The ability to monitor and control one's own behavior, emotions and thoughts to appropriately meet the demands of a situation.

A lack of self regulation has implications:

- Learning
- Health

Self Regulation

Definition: The ability to monitor and control one's own behavior, emotions and thoughts to appropriately meet the demands of a situation.

A lack of self regulation has implications:

- Learning
- Health

Higher risk of:

- Substance abuse
- Eating disorders
- Risky sexual behavior
- Overweight and obesity
- Self injury

Self Regulation

Definition: The ability to monitor and control one's own behavior, emotions and thoughts to appropriately meet the demands of a situation.

A lack of self regulation has implications:

- Learning
- Health
- Life course (or life trajectory)

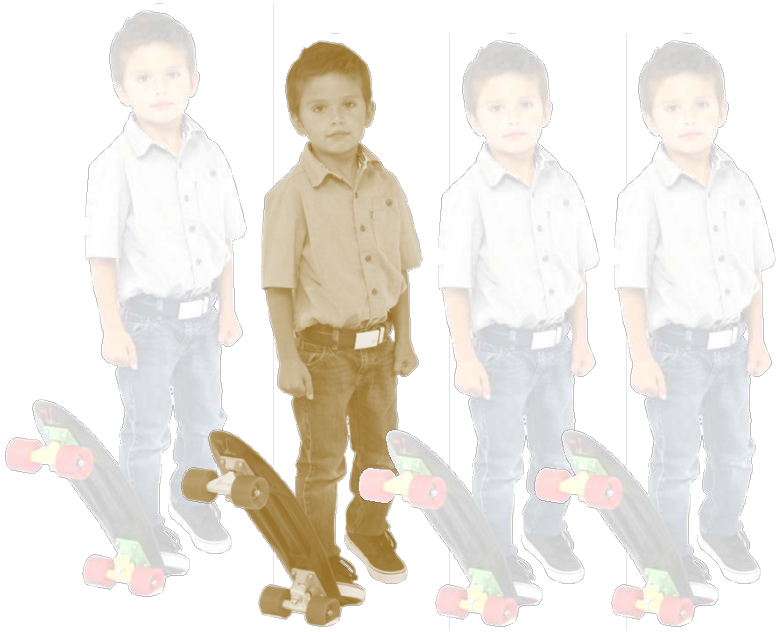
Dysregulation: Hallmark of many disabilities

- Autism spectrum disorder (ASD)
- Attention Deficit Hyperactivity Disorder (ADHD)
- Post traumatic stress disorder (PTSD)
- Unipolar depression, bipolar depression
- Anxiety

Dysregulation: Hallmark of many disabilities

- Autism spectrum disorder (ASD)
- Attention Deficit Hyperactivity Disorder (ADHD)
- Post traumatic stress disorder (PTSD)
- Unipolar depression, bipolar depression
- Anxiety

Social and emotional disabilities (SEDS) affect 1 in 4 children



Exercise is Medicine

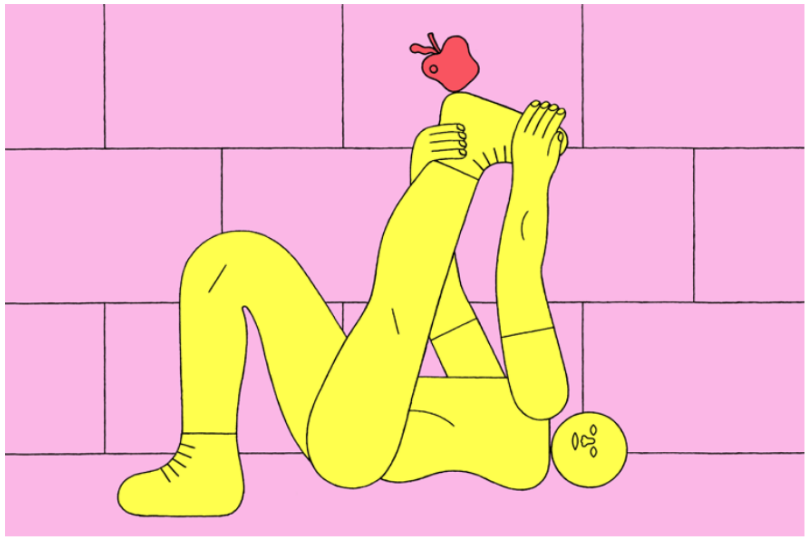
Exercise is Medicine

Your Prescription for Health
ExeRxcise is Medicine®

HOME SEARCH The New York Times

Closest Thing to a Wonder Drug? Try Exercise

Aaron E. Carroll
THE NEW HEALTH CARE JUNE 20, 2016



Dominic Kesterton

After I wrote last year that diet, not exercise, was the key to weight loss, I

Exercise is Medicine

Your Prescription for Health
ExeRxcise is Medicine®

The Atlantic | Popular | Latest | Sections | Magazine

Exercise Is ADHD Medication

Physical movement improves mental focus, memory, and cognitive flexibility; new research shows just how critical it is to academic performance.

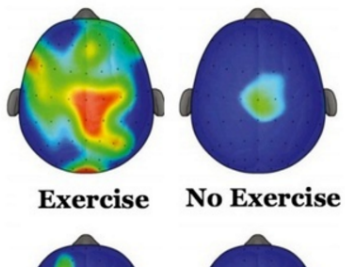
JAMES HAMBLIN | SEP 29, 2014 | HEALTH

Share | Tweet | ...

TEXT SIZE – +

Like *The Atlantic*? Subscribe to The Atlantic Daily, our free weekday email newsletter.

Email SIGN UP

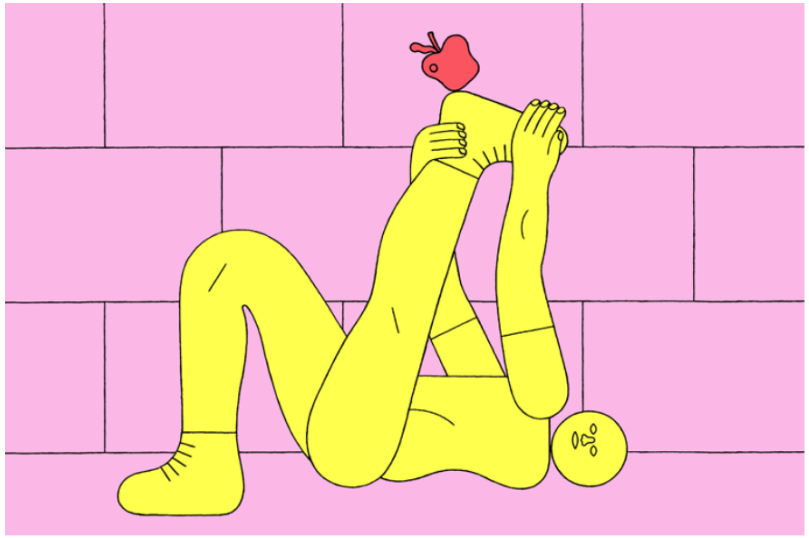


Mental exercises to build (or rebuild) attention span have shown promise recently as adjuncts or alternatives to amphetamines in addressing symptoms common to Attention Deficit Hyperactivity Disorder (ADHD). Building cognitive control, to be better able to focus on just one thing, or single-task, might involve

HOME SEARCH The New York Times

Closest Thing to a Wonder Drug? Try Exercise

Aaron E. Carroll
THE NEW HEALTH CARE JUNE 20, 2016



Dominic Kesterton

After I wrote last year that diet, not exercise, was the key to weight loss, I

Exercise is Medicine

Your Prescription for Health
ExeRxcise is Medicine®

The Atlantic Popular

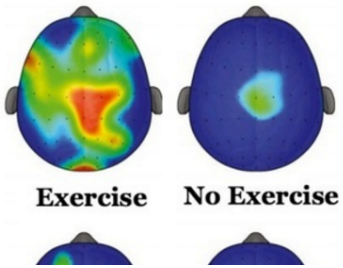
Exercise Is AI Medication

Physical movement improves ment flexibility; new research shows just l performance.

JAMES HAMBLIN | SEP 29, 2014 | HEALTH

Share Tweet ...

Like *The Atlantic*? Subscribe to The Atlantic Daily, our free weekday email newsletter.



HOME SEARCH The New York Times

WELL | MOVE

How Exercise Might Keep Depression at Bay

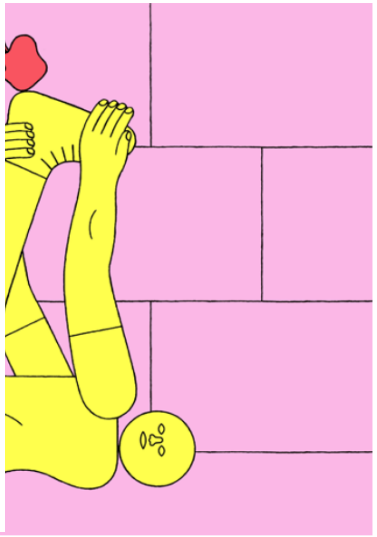
Phys Ed
By GRETCHEN REYNOLDS NOV. 16, 2016

Getty Images

(ADHD). Building cognitive control, to be better able to focus on just one thing, or single-task, might involve

The New York Times

er Drug? Try Exercise



Dominic Kesterton

After I wrote last year that diet, not exercise, was the key to weight loss, I

Objectives

1. Develop a school-based exercise intervention (**Manville Moves**) for children with social and emotional disabilities

Objectives

1. Develop a school-based exercise intervention (**Manville Moves**) for children with social and emotional disabilities

2. Evaluate the feasibility and accessibility of the program

3. Examine effects of the intervention on children's self regulation

Objectives

1. Develop a school-based exercise intervention (**M**
em
2. Ev
pr
3. Examine effects of the intervention on children's self regulation

Implement and test under real world circumstances (practical behavioral trial)

The Manville School

- At the Judge Baker Children's Center, Boston
- Therapeutic day school (K-10th grade)

The Manville School

- At the Judge Baker Children's Center, Boston
- Therapeutic day school (K-10th grade)

Students served (N)	109
Classrooms (N)	14
Mean classroom size	7.8
Number of students by school level (N)	
Lower (grades k – 3)	20
Middle (grades 4-8)	52
Upper (grades 9-10)	37
Gender (% male)	83.5
Free and reduced cost lunch (%)	29

A Participatory Approach

Planning committee

- Harvard Chan + Manville
- Met 2-3 times/month for a year

A Participatory Approach

Planning committee

- Harvard Chan + Manville
- Met 2-3 times/month for a year

1. Reviewed research
2. Identified opportunities for exercise during the school day
3. Reviewed existing school data systems
4. Identified additional funding sources

Davison, Bowling, Garcia, Wood, Hermesch, Prince, Hayes, Kow, Newlan, & Slavet (2016). Contemporary Clinical Trials.

Expresso Bikes

- Developed by Interactive Fitness
- Installed 10 bikes
- Includes games, group rides, ghost challenges
- Personalized online account and login code
- Connected to wifi
- Characteristics of each ride are automatically recorded

Manville Moves

- 7-week Physical Education (PE) curriculum
- Maximum of 2 PE sessions per week
- Maximum of 20 min structured riding time per session; followed by free choice

Manville Moves

- 7-week Physical Education (PE) curriculum
- Maximum of 2 PE sessions per week
- Maximum of 20 min structured riding time per session; followed by free choice

Milestones recognized

5 miles

10 miles

25 miles

Evaluation Design

Group-randomized crossover design

	Fall 2014	Spring 2015
Group A classrooms	Manville Moves	Control (regular PE)
Group B classrooms	Control (regular PE)	Manville Moves

Evaluation Design

Group-randomized crossover design

	Fall 2014	Spring 2015
Group A classrooms	Manville Moves	Control (regular PE)
Group B classrooms	Control (regular PE)	Manville Moves

Passive consent (N=106)
De-identified biking data
De-identified primary outcomes

Active parent consent (N=84)
Family background information
Child health information, physical activity behaviors outside school

Implementation effectiveness

Reach	• %99 of eligible participants • Representative of the school
Dose	• 865 rides completed • Average of 16 mins/ride
Quality of delivery	• 90% of Manville Moves sessions implemented as planned
Responsiveness	• 1% student refusal rate

Outcome Measures

1. Behavioral Self Regulation

- Disciplinary time out of class (min and #/day)

2. Emotional lability, impulsiveness

- Conners Abbreviated Teacher Rating scale (10 items)

Outcome Measures

1. Behavioral Self Regulation

- Disciplinary time out of class (min and #/day)
- 6,489 instances recorded

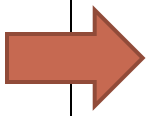
2. Emotional lability, impulsiveness

- Conners Abbreviated Teacher Rating scale (10 items)
- 5,252 records

Meaningful Metrics

1. Behavioral Self Regulation

- Disciplinary time out of class (min and #/day)



- 6,489 instances recorded

Meaningful Metrics

1. Behavioral Self Regulation

- Disciplinary time out of class (min and #/day)
- 6,489 instances recorded

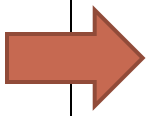
Time Out of Class thresholds

- **Disruptive**
  - 5+ episodes/day
  - 10+ minutes/day
- **Precludes Learning**
  - 90+ minutes (cumulative) per day

Meaningful Metrics

2. Emotional lability, impulsiveness

- Conners Abbreviated Teacher Rating scale (10 items)
- 5,252 records



Meaningful Metrics

2. Emotional lability, impulsiveness

- Conners Abbreviated Teacher Rating scale (10 items)
- 5,252 records

- **Clinical cutoff of 15**

  on a 0-30 scale

Analytic Approach

Logistic normal mixed effects regression

Random effects = individual and classroom

Analytic Approach

Logistic normal mixed effects regression

Random effects = individual and classroom

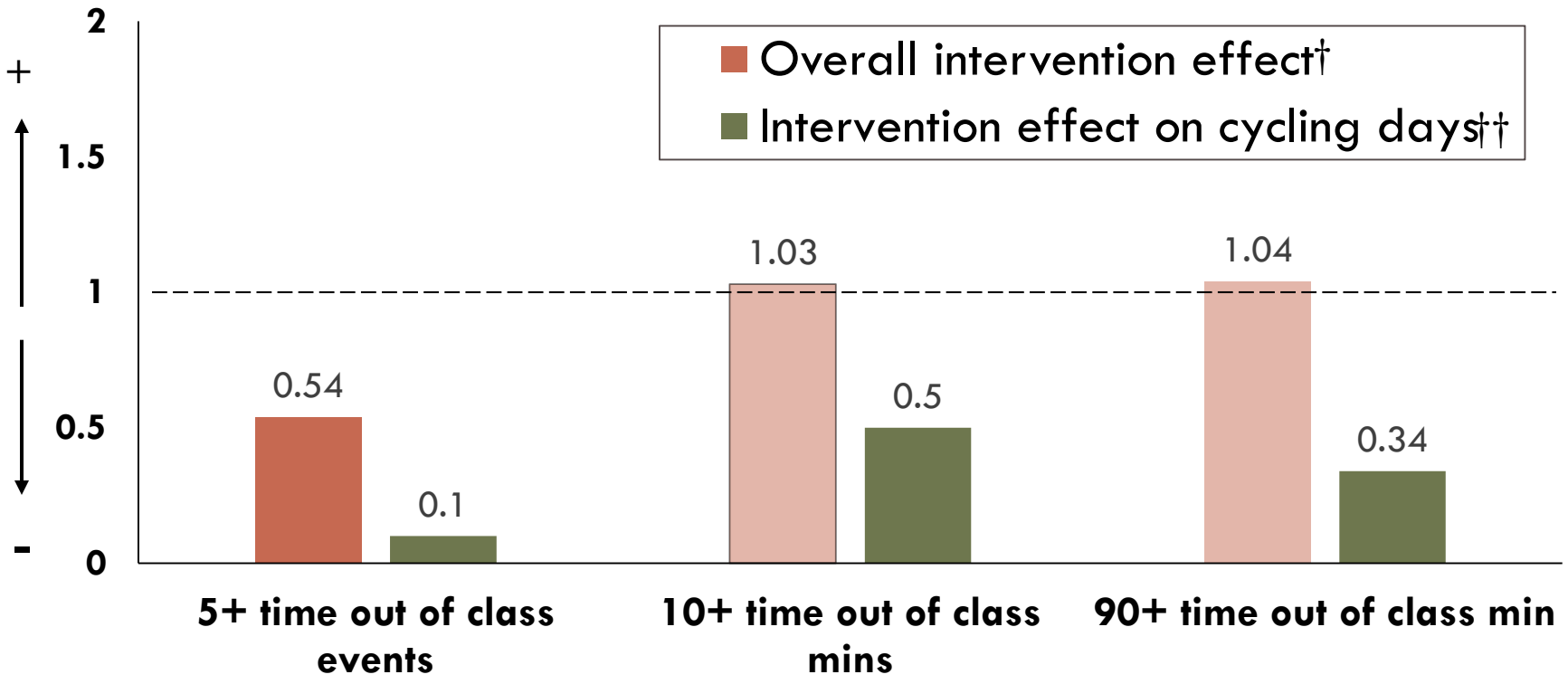
Primary model: Test overall intervention effect

Independent variables = treatment status, treatment order

Secondary model: Test acute effects of intervention

Independent variables = treatment status, treatment order, *whether child biked that day*

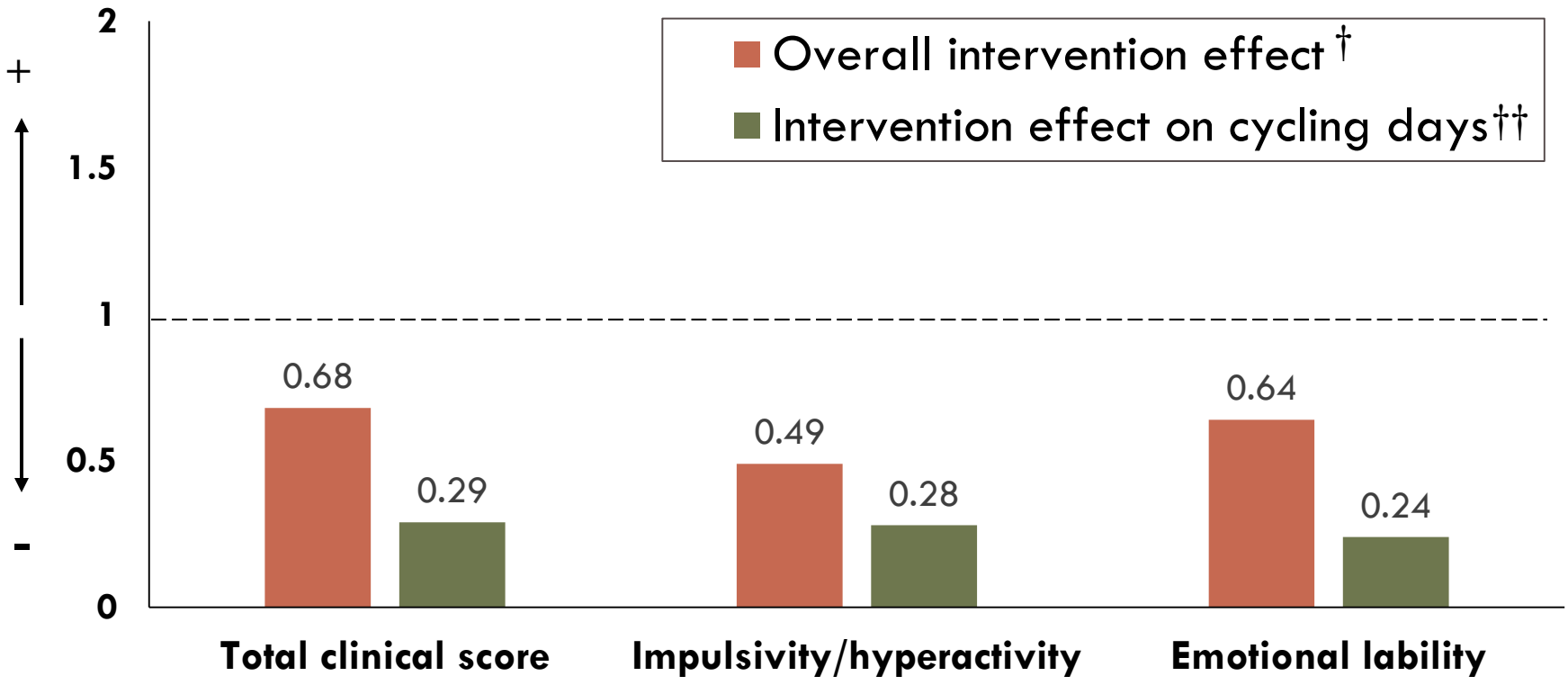
Results: Time out of class



† Adjusted for treatment order and random effects of individual and classroom

†† Adjusted for treatment order, elective biking days, and random effects of individual and classroom

Results: ADHD behavior thresholds



† Adjusted for treatment order and random effects of individual and classroom

†† Adjusted for treatment order, elective biking days, and random effects of individual and classroom

Summary of Results

Compared with the **control** period, when students participated in **Manville Moves** they had:

1. Behavioral Self Regulation	2. Emotional lability, impulsiveness

Summary of Results

Compared with the **control** period, when students participated in **Manville Moves** they had:

1. Behavioral Self Regulation

Disruptive time out of class (5+ episodes/day)

↓ 46%

2. Emotional lability, impulsiveness

- Clinical cut-point

↓ 32%

Summary of Results

Compared with the **control** period, when students participated in **Manville Moves** they had:

1. Behavioral Self Regulation

Disruptive time out of class (5+ episodes/day)

- ↓ 46%
- ↓ 90%

2. Emotional lability, impulsiveness

- Clinical cut-point

- ↓ 32%
- ↓ 71%

Next Steps?

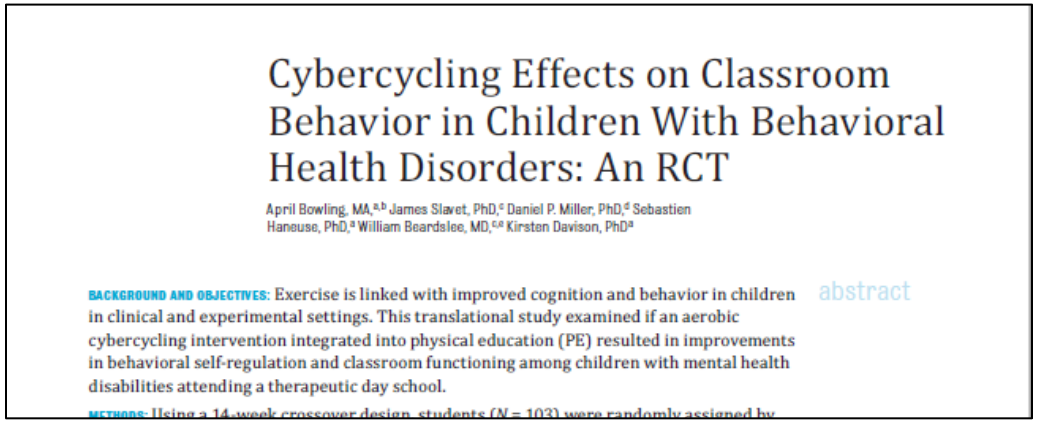
1. More rigorous testing?
   - Objective monitoring of physical activity
   - Alternative outcome measures
   - More schools
   - Non-clinical setting (public schools)

Next Steps?

2. Put into practice?
   - Establish scale up systems
   - Test scale up

Next Steps?

2. Put into practice?
   - Establish scale up systems
   - Test scale up



Cybercycling Effects on Classroom Behavior in Children With Behavioral Health Disorders: An RCT

April Bowling, MA,[a,b] James Slavet, PhD,[c] Daniel P. Miller, PhD,[d] Sebastien Haneuse, PhD,[a] William Beardslee, MD,[c,e] Kirsten Davison, PhD[a]

BACKGROUND AND OBJECTIVES: Exercise is linked with improved cognition and behavior in children in clinical and experimental settings. This translational study examined if an aerobic cybercycling intervention integrated into physical education (PE) resulted in improvements in behavioral self-regulation and classroom functioning among children with mental health disabilities attending a therapeutic day school.

METHODS: Using a 14-week crossover design, students ($N = 103$) were randomly assigned by

abstract

Bowling, Slavet, Miller, Hanuese, Beardsley & Davison KK (2017). Pediatrics. 139(2): e20161985.

Next Steps?

Research

- Make precise statements
- Gold-standard measures
- Randomized controlled trials
- Strict inclusion criteria
- Tightly controlled implementation
- Internal validity valued

Public Health

- Ameliorate current health problems
- More resources devoted to those most at risk
- Efficient progression from research to practice
- External validity valued

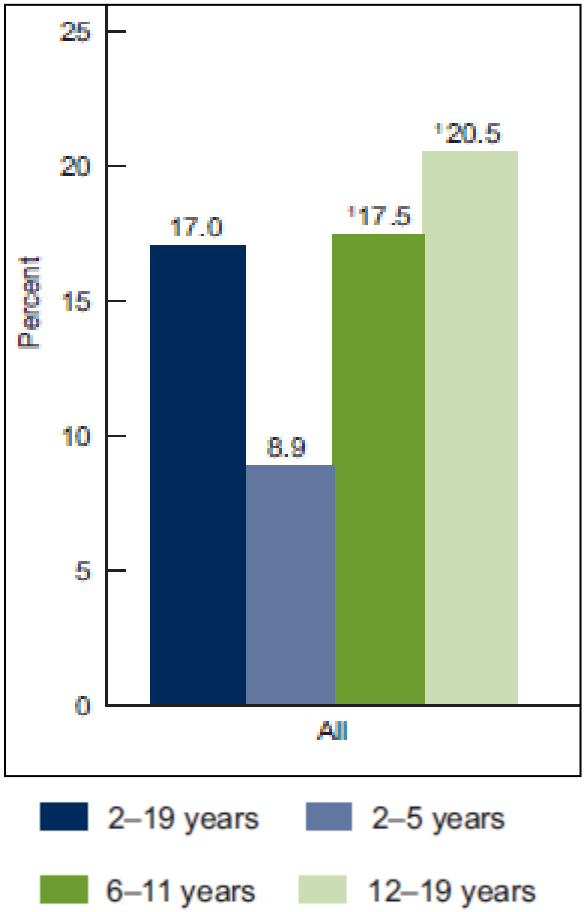
Communities for Healthy Living (CHL)

Childhood obesity prevention

Intervention priorities

- Young children
- Parents and families
- Underserved children

Prevalence of obesity among youth 2-19 years: United States 2011-2014



Predominant focus: Healthy lifestyles

Intervention content:

- ☐ Timing of introduction of solids
- ☐ Limiting sugar-sweetened beverages
- ☐ Meal time routines
- ☐ Turning TV off during meals
- ☐ Parent diet and physical activity modeling
- ☐ Repeated exposure to vegetables

Predominant focus: Parenting skills

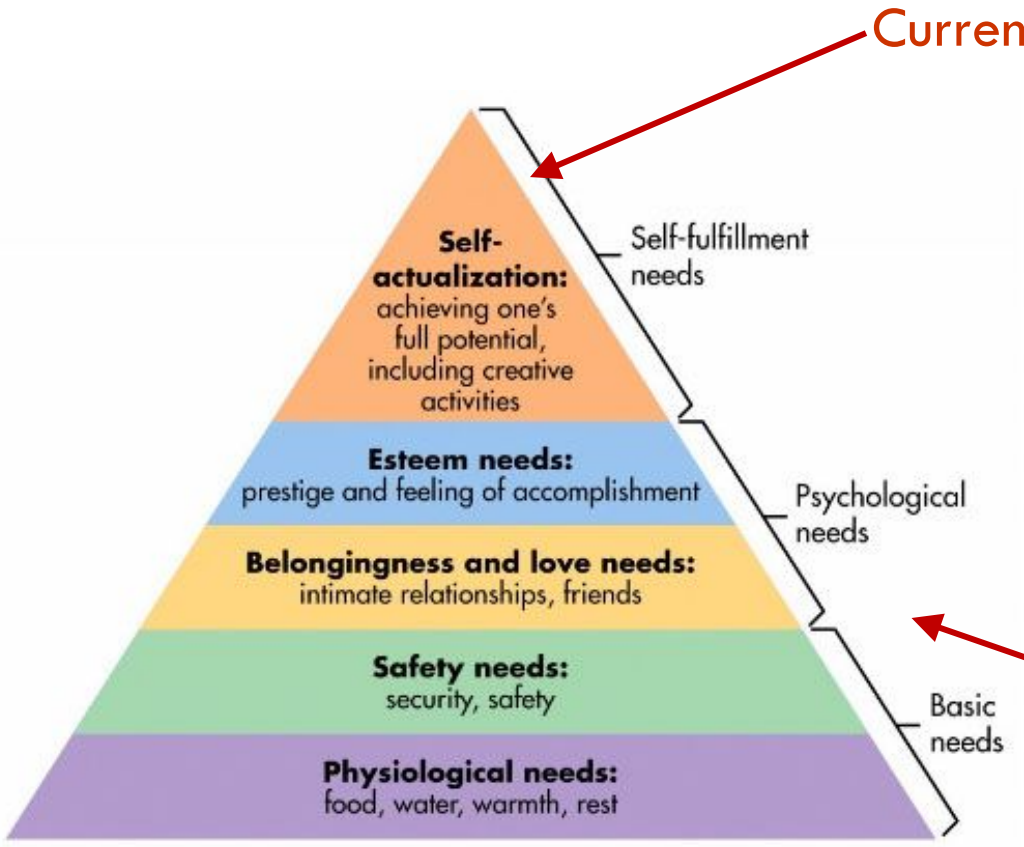
Intervention content:

- ☐ Responsive parenting
- ☐ Child sleep routines (soothe to sleep)
- ☐ Authoritative parenting style
- ☐ Child emotion regulation
- ☐ Co-parenting

Challenges with Family Interventions

1. Reaching families
2. Engaging families

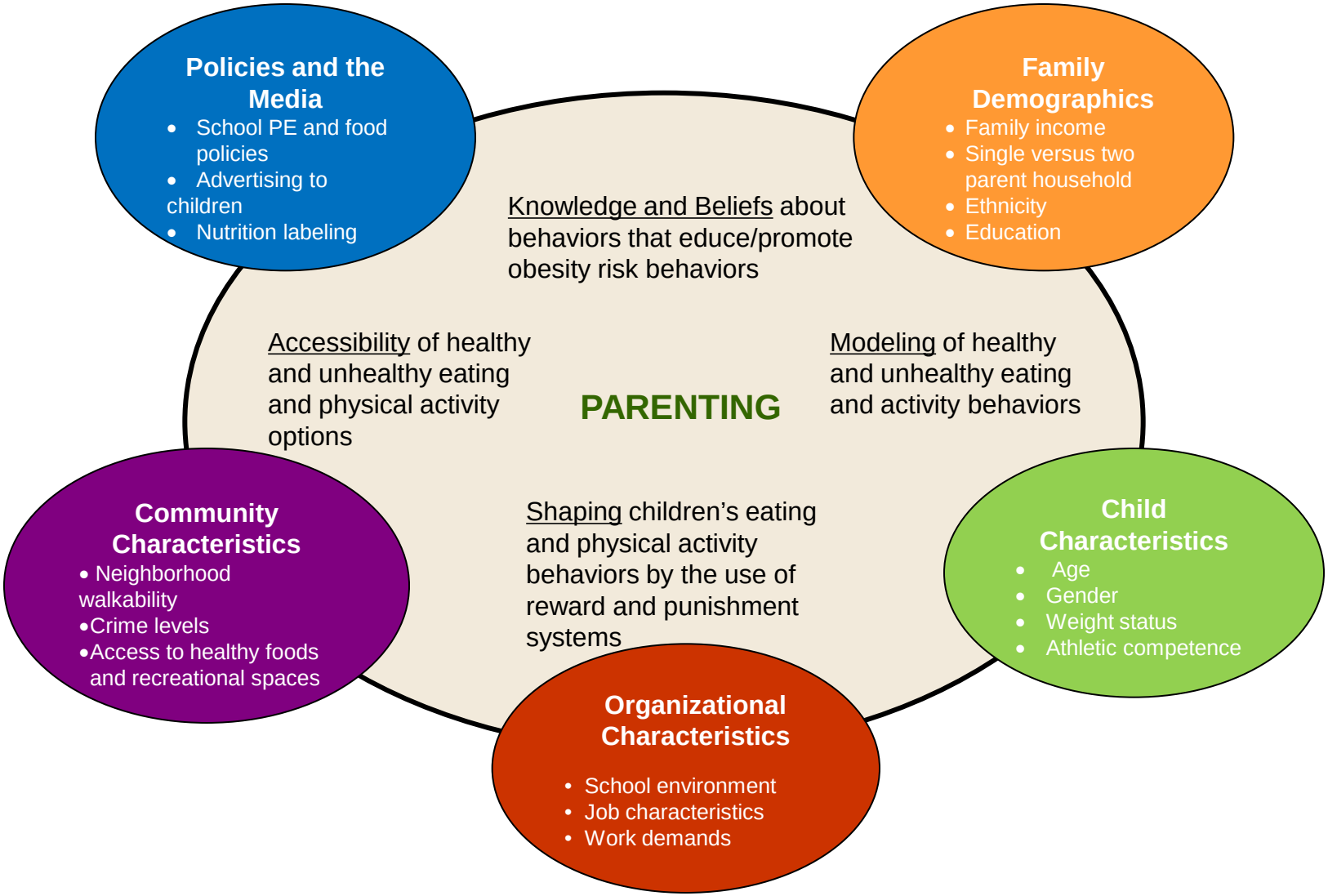
Challenges with Family Interventions



1. Reaching families
2. Engaging families

Misalignment of interventions and family priorities

Family Ecological Model



Davison & Campbell (2005). Opportunities to prevent obesity in children within families.: An ecological approach. Obesity Prevention and Public Health (Oxford University Press)

Pilot Study: Albany, NY

RESEARCH Open Access

A childhood obesity intervention developed by families for families: results from a pilot study

Kirsten K Davison[1*], Janine M Jurkowski[2], Kaigang Li[3], Sibylle Kranz[4] and Hal A Lawson[5]

Funded by National Institutes of Minority Health and Health Disparities $1.2 M

Pilot Study: Albany, NY

RESEARCH Open Access

A childhood obesity intervention developed by families for families: results from a pilot study

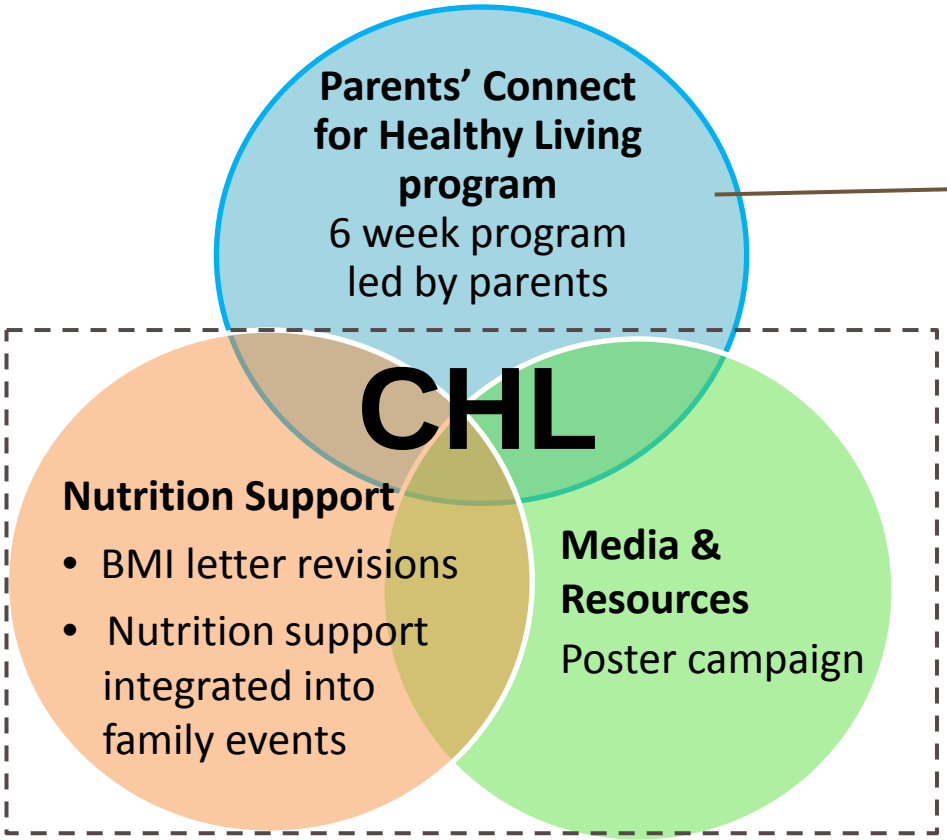
Kirsten K Davison[1*], Janine M Jurkowski[2], Kaigang Li[3], Sibylle Kranz[4] and Hal A Lawson[5]

Funded by National Institutes of Minority Health and Health Disparities $1.2 M

Why Head Start?

1. Reach
2. Overlapping objectives
3. Potential for sustainability

CHL Intervention Components



Topics

Resource empowerment
Media literacy
Communication skills
Conflict resolution

(obesity prevention: diet, physical activity, media use)

Key Findings (N=156 children)

- Significant pre-post intervention improvements in:
  - Child diet
  - Percentage of children with obesity (>95th BMI%)
  - Food and physical activity parenting practices
  - Parent resource empowerment

Key Findings (N=156 children)

- Significant pre-post intervention improvements in:
  - Child diet
  - Percentage of children with obesity (>95th BMI%)
  - Food and physical activity parenting practices
  - Parent resource empowerment

Feasible to implement

Acceptable to parents and Head Start staff

CHL Boston

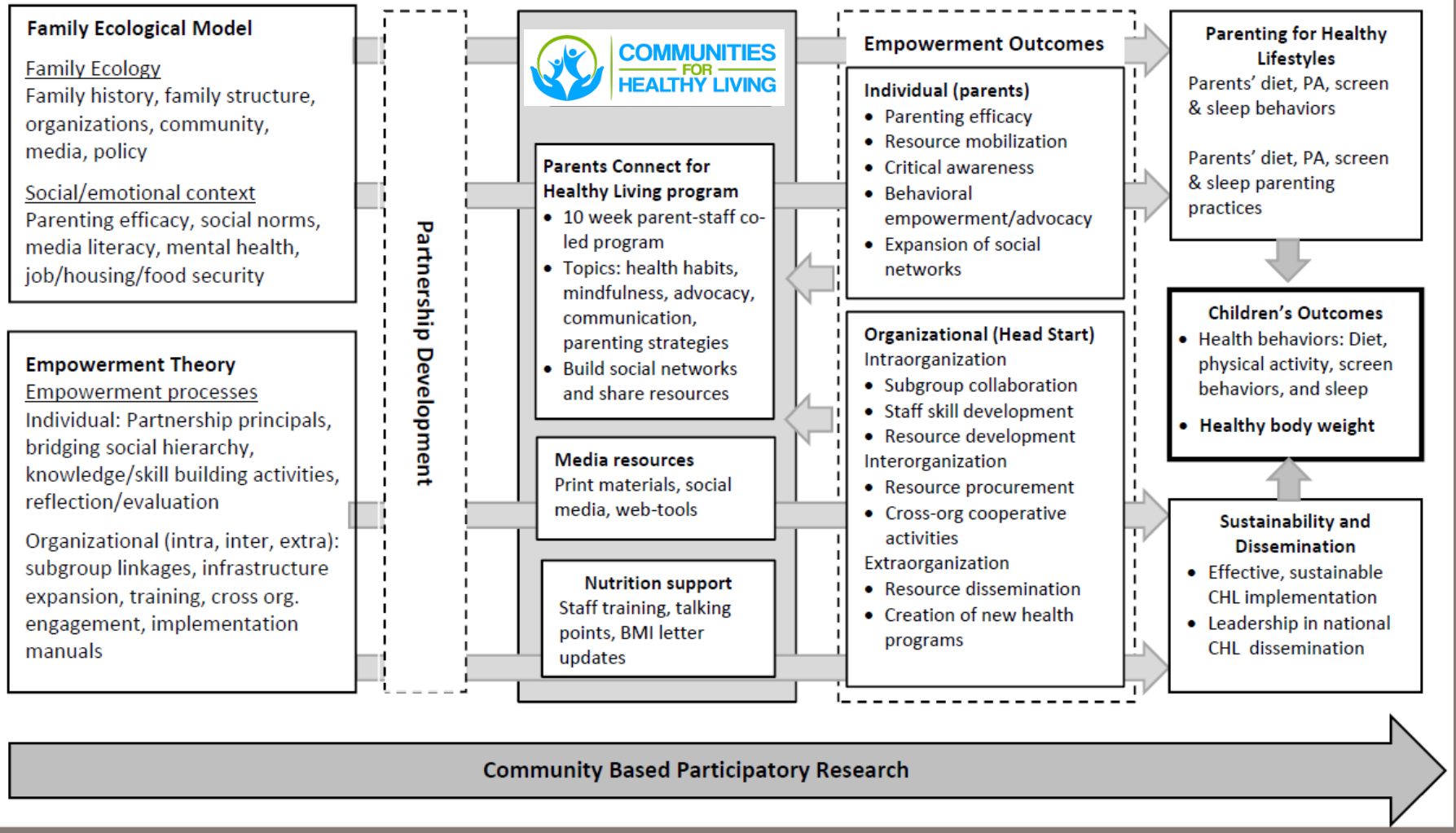
5-year trial funded by the NIDDK

- 23 Head Start centers (2 programs)
- 2500 children/year
- Cluster-randomized controlled trial

abcd
Action for Boston Community Development, Inc.
Head Start & Children's Services

CAAS

Communities for Healthy Living (CHL) program
Partners: Harvard School of Public Health, Boston (ABCD) and Cambridge/Somerville (CAAS) Head Start



Research Team: Investigators

Kirsten K. Davison
Harvard Chan School of Public Health

Janine M. Jurkowski
University at Albany

Adrienne Vigilante
CAAS
Head Start

Sebastien Hanuese
Harvard Chan School of Public Health

Elsie M. Taveras
Massachusetts General Hospital

Sonia Carter
ABCD
Head Start

Research Team: Students and Staff










Key Innovations

- **Preparation for scale up**
  - PConnect peer leaders = parent + staff
  - Aligned with Head Start performance standards
  - Coaching model
  - Implemented in two Head Start programs (small, large)
  - Operations led by Head Start (not researchers)
  - Manualize intervention

Key Innovations

- **Utilization of existing data system**
  - Measures of child BMI and target behaviors compiled for all enrolled children (passive consent)

- **Supplemented with data from a sub-cohort**

  (active consent)

Stepped Wedge Design

- Center randomly assigned center to start time
- Three possible start times

Head Start Center Clusters	Baseline (2016-2017)	Year 1 (2017-2018)	Year 2 (2018-2019)	Year 3 (2019-2020)
Group 1		START		
Group 2			START	
Group 3				START

Stepped Wedge Design

- Center randomly assigned center to start time
- Three possible start times

Head Start Center Clusters	Baseline (2016-2017)	Year 1 (2017-2018)	Year 2 (2018-2019)	Year 3 (2019-2020)
Group 1	X X	X **START** X	X X	X X
Group 2	X X	X X	X **START** X	X X
Group 3	X X	X X	X X	X **START** X

Timeline

Phase 1

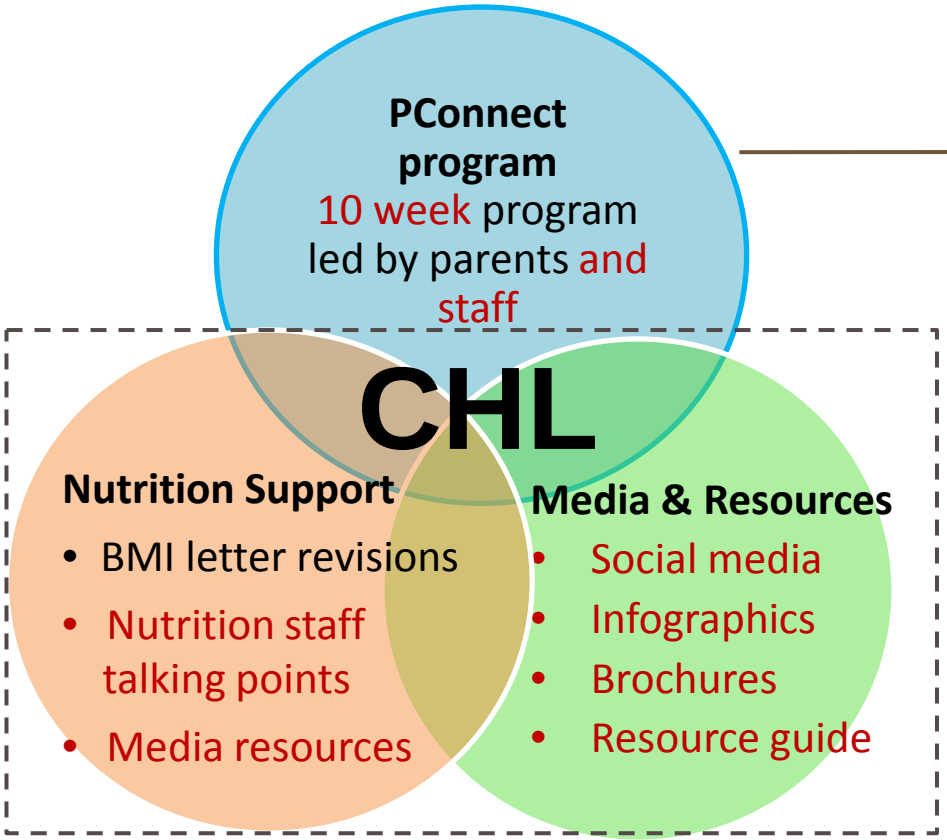
2015-2016

Adapt CHL

Collaborate with two advisory boards to:

- Expand PConnect
  - 6 to 10 weeks
  - Parents + staff
  - Multiple languages
- Update media
- Link with weight management programs
- Manualize intervention

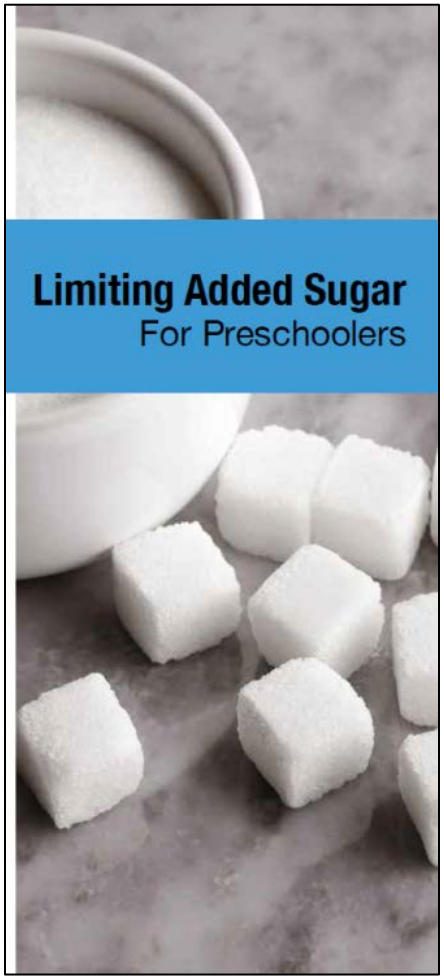
CHL Intervention Components



Topics

Resource empowerment
Media literacy
Communication skills
Conflict resolution
Mindfulness
Child development
Neighborhoods & health
Parent advocacy
Behavioral health
Sleep
(obesity prevention: diet, physical activity, media use, sleep)

Media Resources



What is added sugar?

Added sugars are sugars in foods or drinks that are not found in them naturally. Examples of added sugars are:

- table sugar
- honey
- agave
- corn syrup

Some foods, like milk and fruit, have sugar in them naturally. These natural sugars are different from sugar that is added to foods or drinks.

Read the nutrition label to check if a food or drink has added sugars in it.

Nutrition Facts		
Serving Size: 1 bottle (20oz)		
Serving Per Container: 1		
Amount Per Serving		
Calories	275	
		% Daily Value*
Total Fat	0g	**0%**
Sodium	175 mg	**7%**
Total Carbohydrate	78 g	**26%**
Sugars	65 g	
Protein	0 g	

INGREDIENTS: Water, Sucrose, Glucose, High Fructose Corn Syrup, Natural Flavors, Artificial Colors, Ascorbic Acid.

How much added sugar should preschoolers have?

- Children younger than age 2: should have no added sugars
- Children older than age 2: should have no more than 25 grams (6 teaspoons) of added sugar per day

Why is it important to limit added sugars?

Added sugars are not a healthy part of your child's diet. Eating too much added sugar can lead to a risk of:

- Heart disease
- Unhealthy weight
- High blood pressure
- Tooth decay

What can you do at home to limit added sugars?

1. Avoid eating processed foods. Processed foods can have a lot of added sugars.
2. Drink water instead of sugary drinks such as soda and fruit juice.
3. Eat whole fruits instead of drinking fruit juice.
4. Choose foods like fruits and vegetables that have no added sugars.
5. Drink unflavored, unsweetened milk.

How is Head Start limiting the added sugars in your child's food?

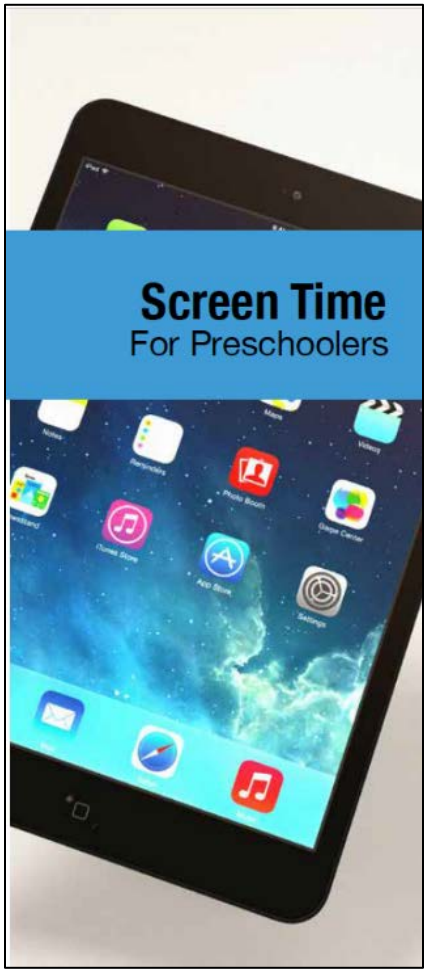
- Head Start serves cereal and yogurt that have small amounts of added sugars.
- Head Start does not serve sugary drinks such as soda or sports drinks.
- Head Start serves unflavored milk. Unflavored milk has less added sugar than flavored milk.

Recommended Books

Check out these children's books about sugar and a healthy diet to read to your child!

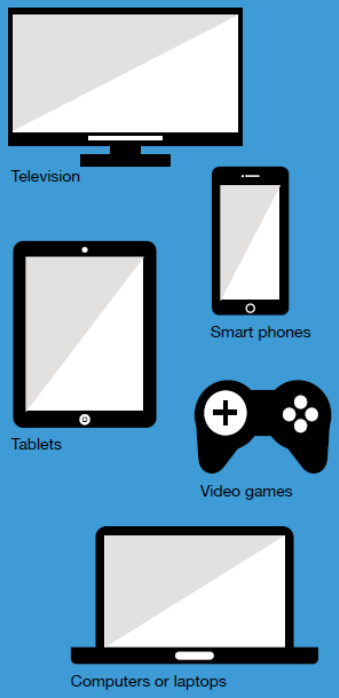
- What's in Grandma's Grocery Bag? by Hui-Mei Pan
- Eating the Alphabet by Lois Ehlert
- Sweet Pete and the Magical Cookie Jar by Maria Alony
- Gregory, the Terrible Eater by Mitchell Sharmat
- The Boy Who Loved Broccoli by Sarah A. Creighton

Media Resources



What is screen time?

Screen time refers to time spent sitting in front of a screen for entertainment.
Examples:



What can you do at home to help your child have good screen time habits?

1. Set limits on your child's screen time.
2. Talk to your child about changes you can make together to limit screen time. Be prepared to hear complaints, but stay with your decision!
3. Avoid using screen time as a reward for good behavior or a punishment for bad behavior.
4. Avoid using your phone or tablet at the dinner table.
5. Check that your child's screen content is appropriate and educational.

What is Head Start doing to help children have good screen time habits?

- Some classrooms have timers for computer and tablet use.
- There is no internet in the classroom.
- Only computers or tablets are allowed.
- A limited use of technology for group activities is allowed.

Recommended Books

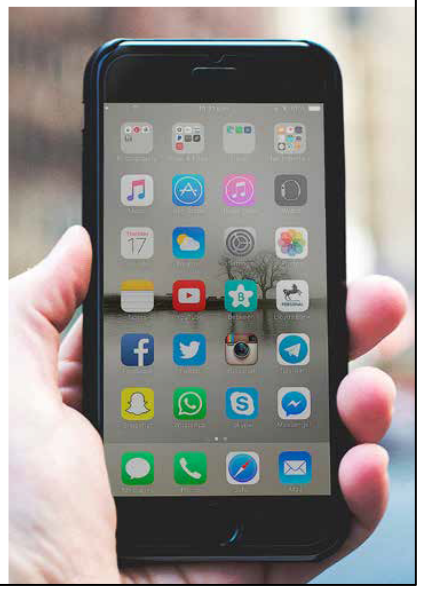
Check out these children's books about screen time alternatives to read to your child!

- Lulu Loves the Library by Anna McQuinn
- D.W.'s Library Card by Marc Brown
- Bailey at the Museum by Harry Bliss
- Babar's Museum of Art by Laurent de Brunhoff

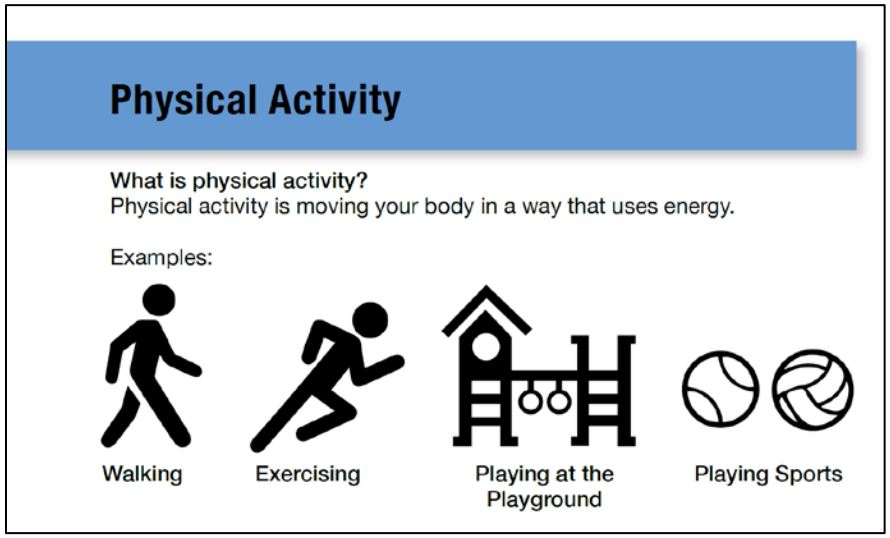
What can happen if kids spend too much time on screens?

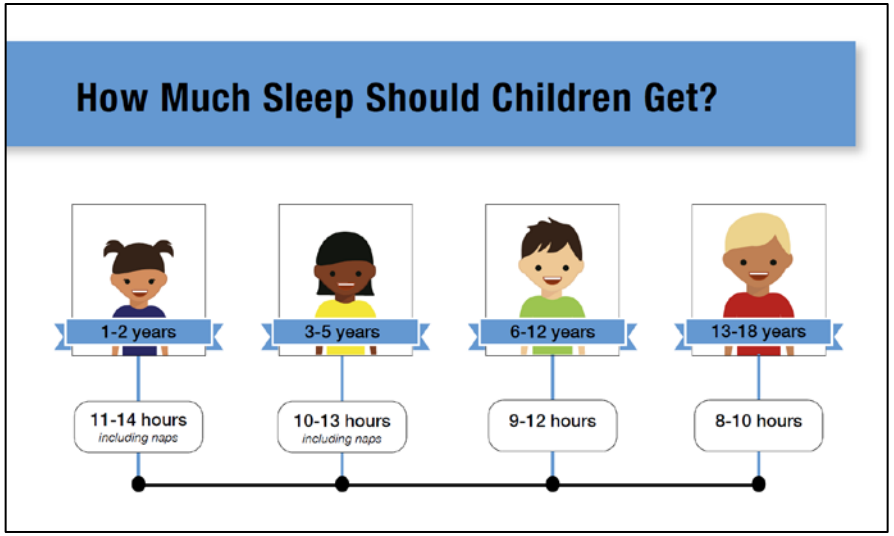
Kids may:

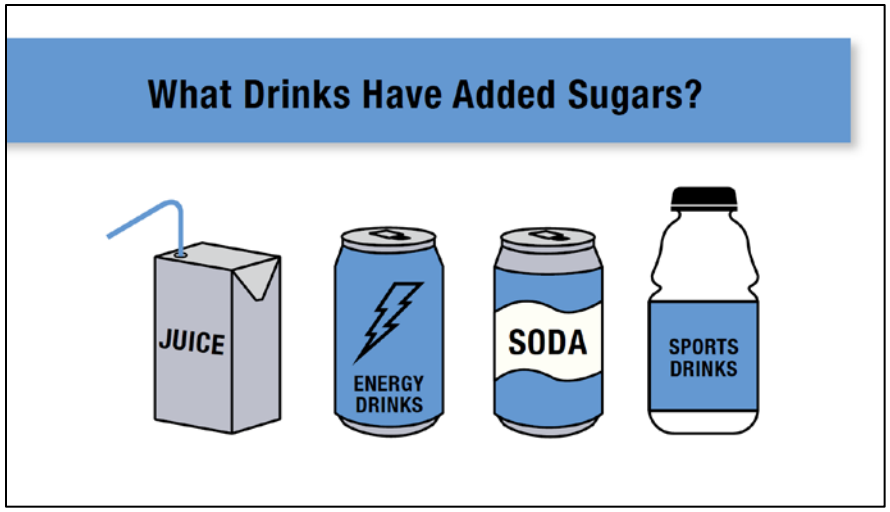
- Be less physically active
- Have problems with attention, behavior, and schoolwork
- Gain unhealthy weight
- See advertisements for unhealthy foods
- See violent or scary images
- Have trouble sleeping

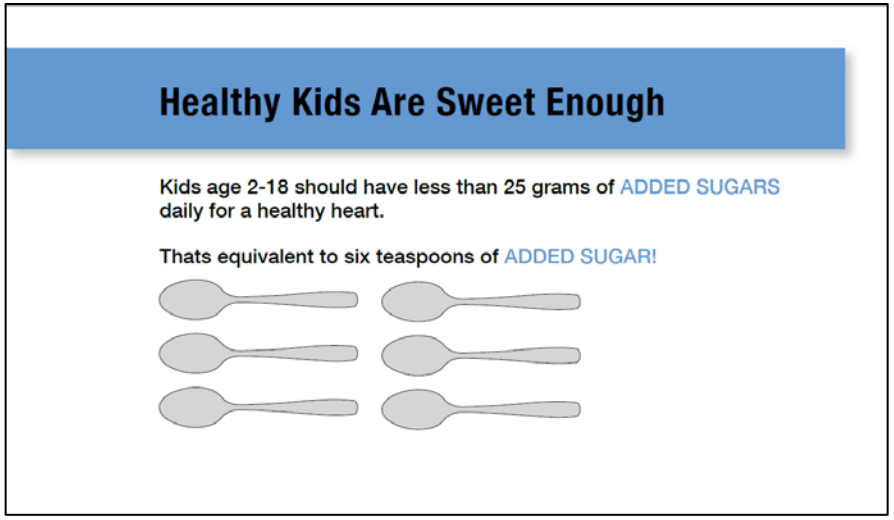


Infographics

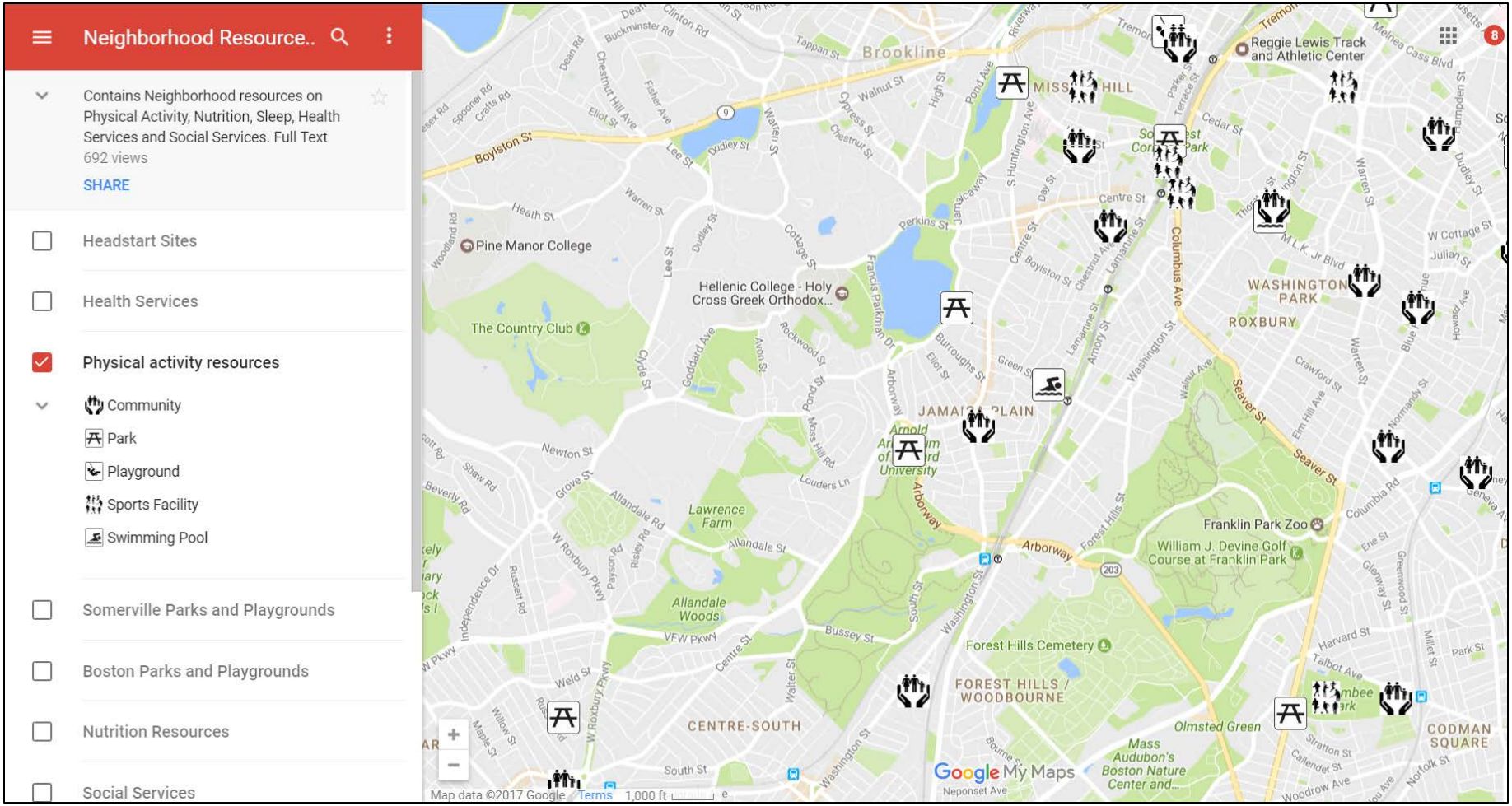








Online Neighborhood Resource Guide



Timeline

Phase 1
2015-2016

Adapt CHL

Collaborate with two advisory boards to:

- Expand PConnect
  - 6 to 10 weeks
  - Parents + staff
  - Multiple languages
- Update media
- Link with weight management programs
- Manualize intervention

Phase 2
2016-2017

Pilot test

- Test PConnect in two early-adopter centers
- Pilot test measures
- Begin baseline data collection

Redesigning and testing PConnect

Timeline

Phase 1
2015-2016

Adapt CHL

Collaborate with two advisory boards to:

- Expand PConnect
  - 6 to 10 weeks
  - Parents + staff
  - Multiple languages
- Update media
- Link with weight management programs
- Manualize intervention

Phase 2
2016-2017

Pilot test

- Test PConnect in two early-adopter centers
- Pilot test measures
- Begin baseline data collection

Phase 3
2017-2020

Implement trial

- Randomly assign 21 centers to 1 of 3 CHL start times
- Extract child data annually (total ~9000 children)
- Mixed methods evaluation of implementation

Next 5-10 Years?

- Scale up and national dissemination
  - Manville Moves
  - Communities for Healthy Living
- Sleep and infant growth trajectories


- Fathers and childhood obesity prevention
  - Establish cohort of fathers