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SCHOOL GARDENS & PHYSICAL ACTIVITY:

Among the mechanisms linking green space to health?

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GARDENS MAY AFFECT PHYSICAL ACTIVITY + DIET

WHAT'S THE EVIDENCE?
do gardens affect physical activity?

- Time outdoors predicts PA among youth (Ferriera, 2006; Sallis et al., 2000).

- Pilot study suggest school gardens may lead to increased frequency of PA among children (Hermann et al., 2006; Phelps et al., 2010)

- Gardening linked to PA among adults (Twiss et al., 2003; Sommerfeld et al., 2010).

However, there is a relative dearth of data.

OUR STUDY:

- Builds on larger USDA-funded study examining effects of gardens on dietary intake, nutritional knowledge, etc.
- 3000+ children, 48 schools in four states: Arkansas, Iowa, New York, Washington
- All under-resourced schools (50% or higher FRPM)
- Schools randomly assigned to intervention or waitlist control
- 4 waves of data collection: Fall 2011 – Spring 2013

OUR STUDY:

- Builds on larger USDA-funded study examining effects of gardens on dietary intake, nutritional knowledge, etc.
- 3000+ children, 49 schools in four states: Arkansas, Iowa, New York, Washington
- All under-resourced schools (50% or higher FRPM)
- Schools randomly assigned to intervention or waitlist control
- 4 waves of data collection: Fall 2011 – Spring 2013

<u>GARDENS→ PHYSICAL ACTIVITY STUDY:</u>

- New York State: 5 regions, 12 elementary schools
  - 4^{th} – 5^{th} grade at baseline (age 9-11 years)
    - Funded by RWJF Active Living Research

THE INTERVENTION

- Funded by the USDA People's Garden Program
- Partnered with ~ 2 teachers & classes at each school
- Local Cooperative Extension Educators
- Raised bed or container garden kits
- Garden-based curriculum of 40 lessons for 2 years

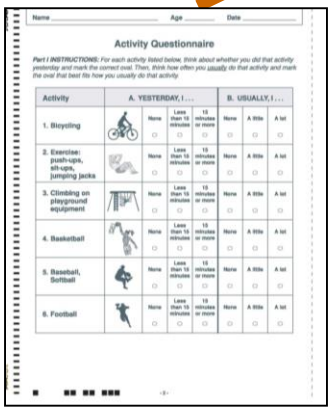
RESEARCH QUESTIONS

1. Do school gardens affect children's overall PA and sedentary activity as measured by the GAQ (survey)?

2. Do school gardens affect PA levels during the school day, as measured with accelerometry?

3. Does PA, measured by direct observation, differ during indoor classroom lesson v. outdoor garden lesson?

ASSESSING PHYSICAL ACTIVITY
multiple measures

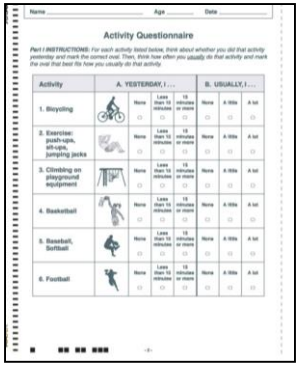

Activity Questionnaire

SURVEY

ACCELEROMETERS
(objective measure)

DIRECT OBSERVATION

ASSESSING PHYSICAL ACTIVITY
multiple measures


Name _____ Age _____ Date _____

Activity Questionnaire

Part I INSTRUCTIONS: For each activity listed below, think about whether you did that activity yesterday and mark the correct oval. Then, think how often you usually do that activity and mark the oval that best fits how you usually do that activity.

Activity		A. YESTERDAY, I ...			B. USUALLY, I ...		
1. Bicycling		None	Less than 15 minutes	15 minutes or more	None	A little	A lot
2. Exercise: push-ups, sit-ups, jumping jacks		None	Less than 15 minutes	15 minutes or more	None	A little	A lot
3. Climbing on playground equipment		None	Less than 15 minutes	15 minutes or more	None	A little	A lot
4. Basketball		None	Less than 15 minutes	15 minutes or more	None	A little	A lot
5. Baseball, Softball		None	Less than 15 minutes	15 minutes or more	None	A little	A lot
6. Football		None	Less than 15 minutes	15 minutes or more	None	A little	A lot

GAQ – General Activity Questionnaire – in and out of school (Treuth et al.)

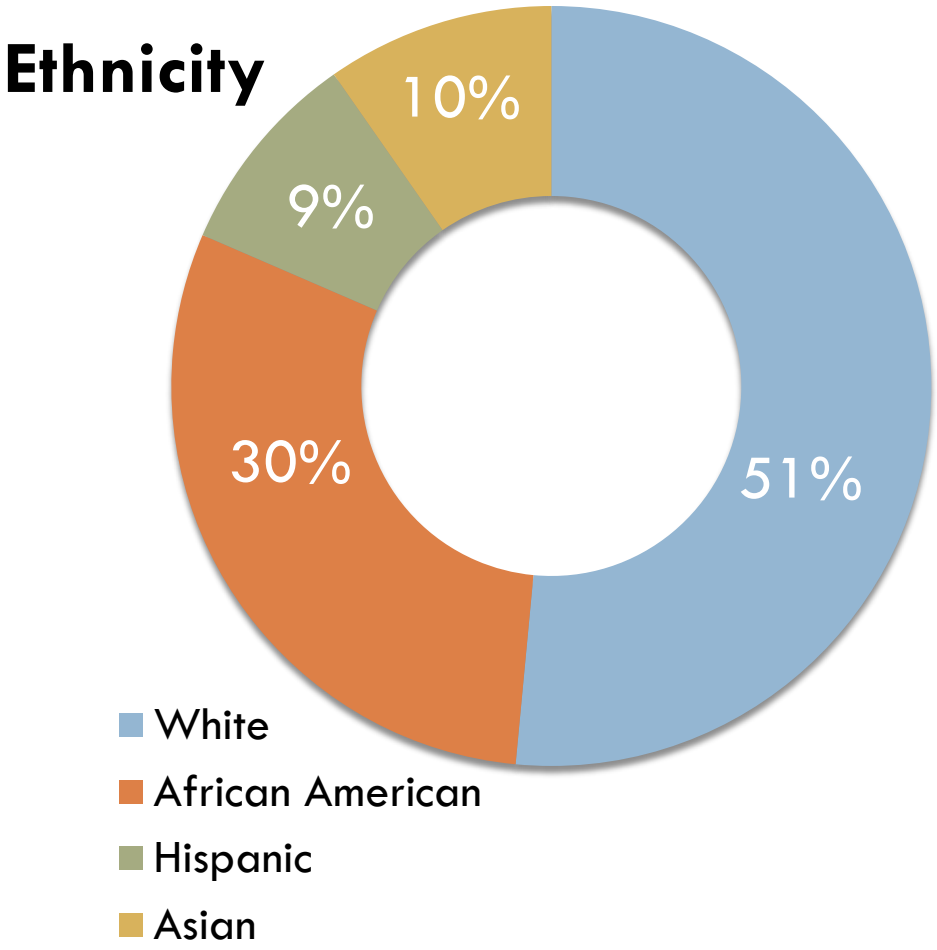
Physical Activity – usually (0 - 10)
Physical Activity – yesterday (0 – 10)
Sedentary Activity – usually (0 – 2.5)
Sedentary Activity – yesterday (0 – 2.5)

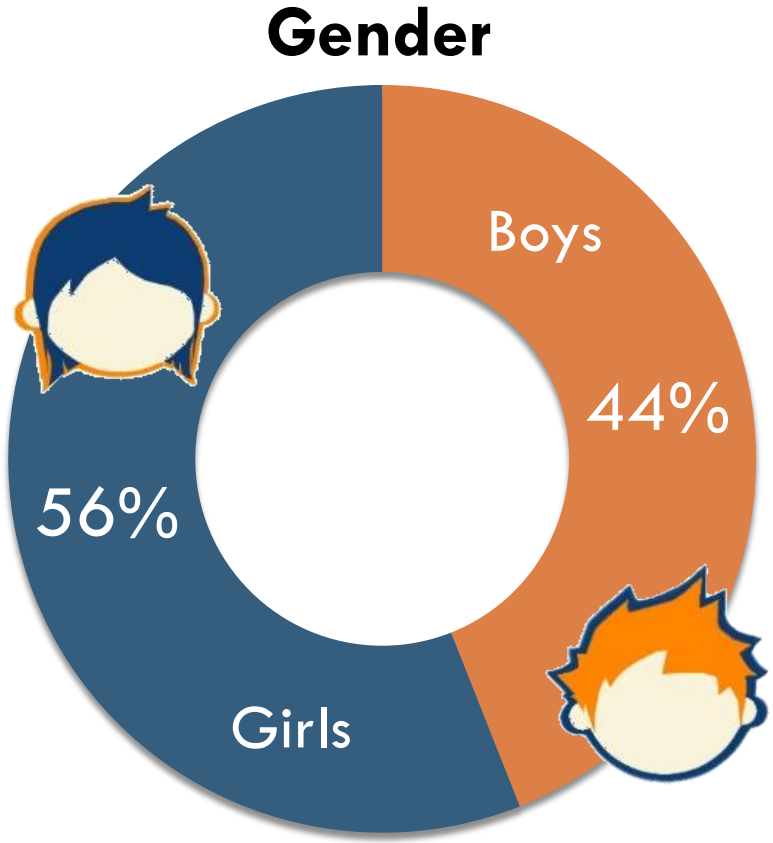
ACCELEROMETRY – during the school day (for 3 days)

% Sedentary
% Light PA
% Moderate PA
% Vigorous PA
% MVPA = Moderate + Vigorous PA

DIRECT OBSERVATION (PARAGON) (Myers + Wells, In Press)
Classroom lesson v. Garden lesson: % lying, % sitting, % kneeling, % standing, % squatting, % walking, % very active

PARTICIPANT ETHNICITY + GENDER (N=227)

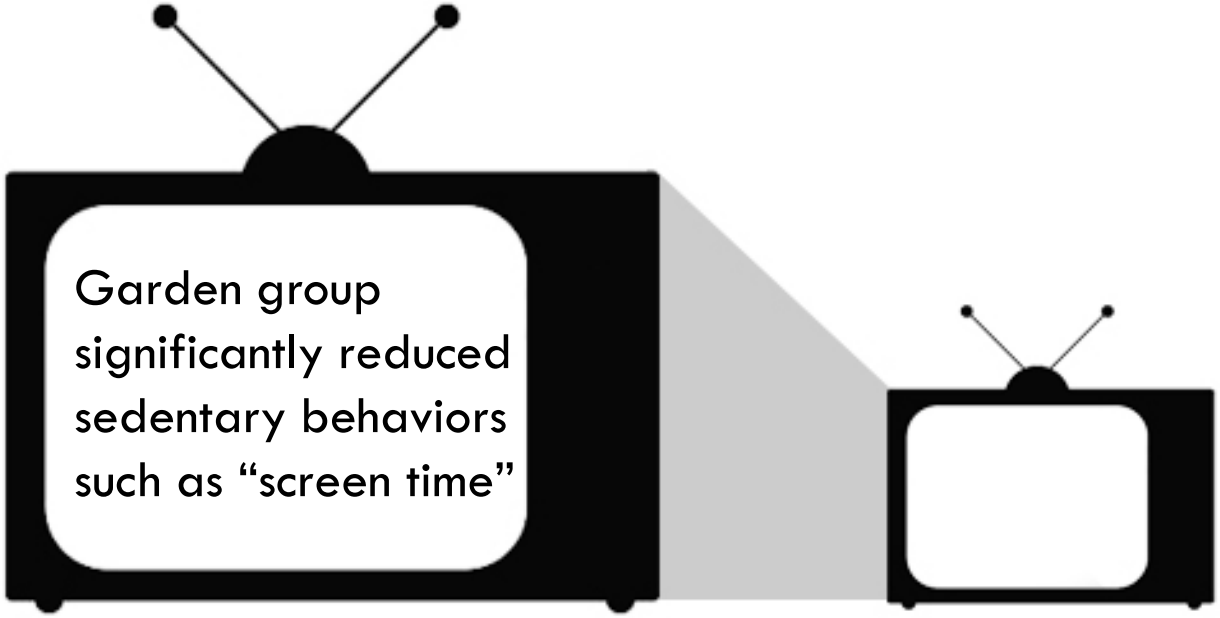




RESULTS

1. Do school gardens affect children's overall PA and sedentary activity as measured by the GAQ?

GAQ survey results indicate that children at the garden schools reduced their usual sedentary activities from baseline to follow-up more than children at control schools.



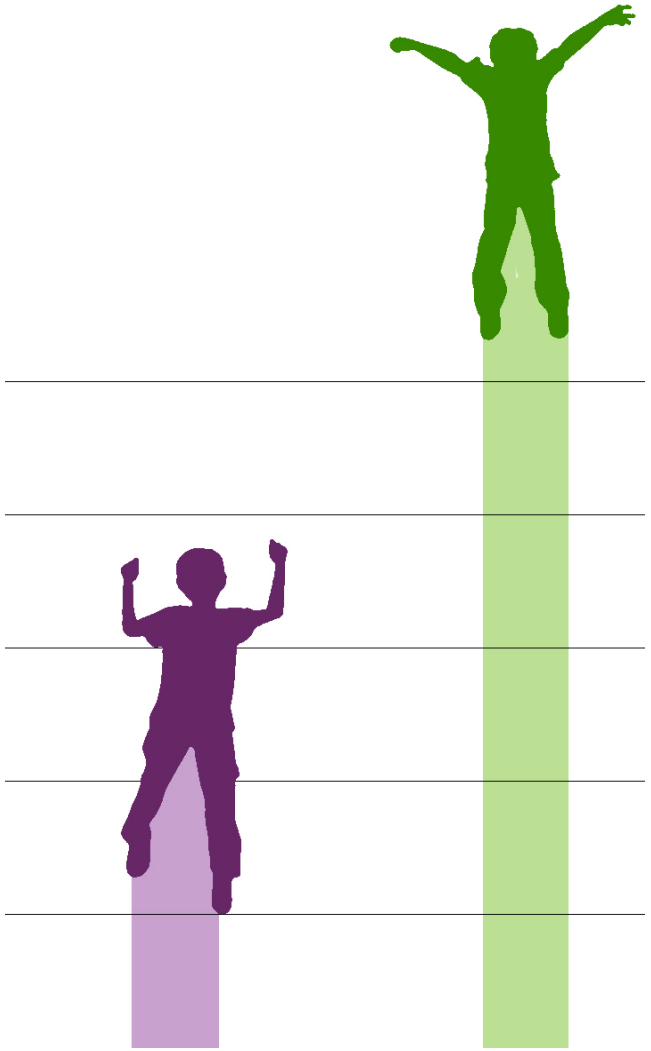
1. Do school gardens affect children's overall PA and sedentary activity as measured by the GAQ?

Physical Activity (PA) data + Sedentary Activity by intervention / control and pre-garden (Wave 1) to post-garden (Waves 2,3,4) (N=227)

	Intervention		Control		
	Pre (W1)	Post (W2-W4)	Pre (W1)	Post (W2-W4)	
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	p-value
PA Yesterday	2.91 (0.19)	2.48 (0.20)	2.74 (0.17)	2.51 (0.19)	0.312
PA Usually	3.78 (0.18)	3.43 (0.19)	3.61 (0.16)	3.63 (0.18)	0.083
Sedentary Yesterday	0.63 (0.04)	0.51 (0.04)	0.57 (0.04)	0.54 (0.04)	0.064
Sedentary Usually	.78 (.05)	.68 (.05)	.68 (.04)	.77 (.05)	.001**
** $p < .01$					

2. Do school gardens affect PA during the school day, as measured with accelerometry?

Accelerometry data indicate that children at the garden schools increase the percentage of the school day that is spent in both moderate and moderate-to-vigorous physical activity more than children at the control schools.



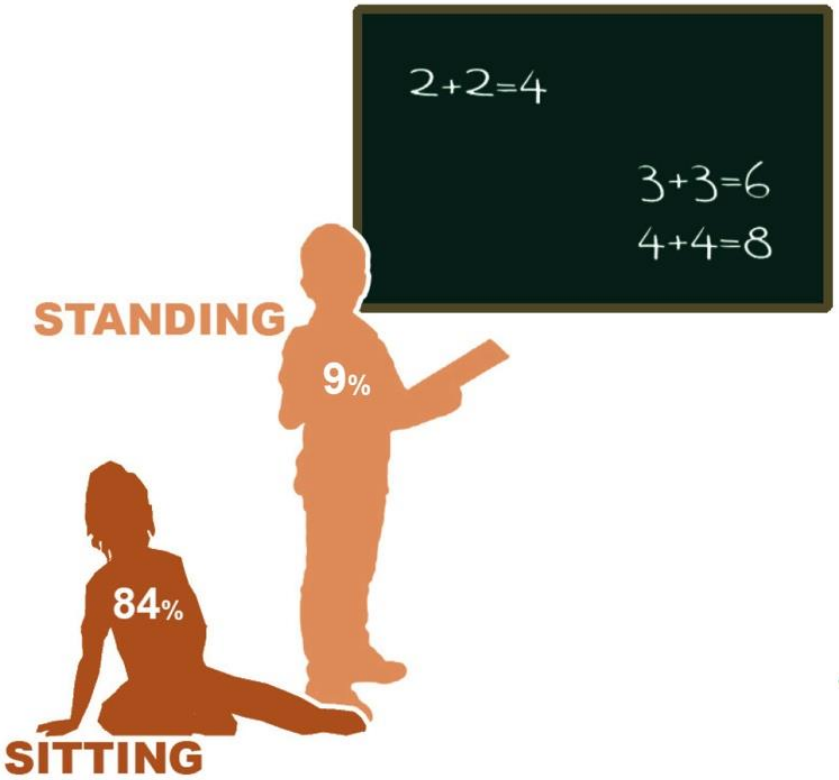
2. Do school gardens affect PA during the school day, as measured with accelerometry?

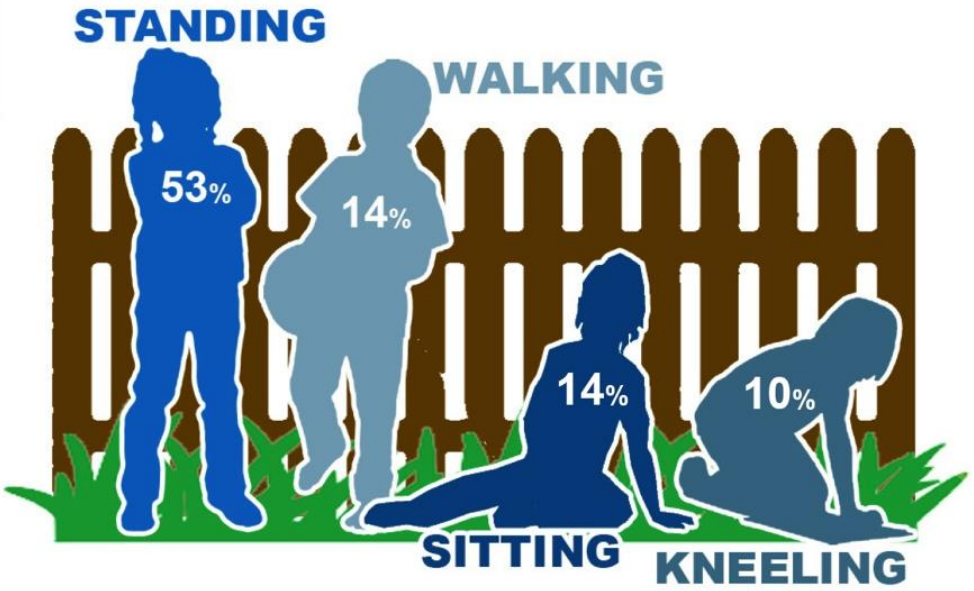
Physical activity (accelerometry) data by intervention / control and pre-garden (Wave 1) to post-garden (Waves 2, 3, 4) (N=124)

	Intervention		Control		
	Pre (W1)	Post (W2-W4)	Pre (W1)	Post (W2-W4)	
	Mean (SE)	Mean (SE)	Mean (SE)	Mean (SE)	p-value
% Sedentary	55.23 (1.71)	55.00 (1.73)	54.75 (1.59)	56.11 (1.60)	0.144
% Light PA	34.62 (1.00)	33.17 (1.02)	35.09 (0.92)	33.07 (0.93)	0.492
% Moderate PA	5.17 (0.54)	5.62 (0.54)	5.41 (0.50)	5.28 (0.50)	0.010*
% Vigorous PA	5.01 (0.58)	6.24 (0.59)	4.99 (0.54)	5.78 (0.54)	0.213
% MVPA	10.14 (1.03)	11.82 (1.04)	10.35 (0.95)	11.03 (0.95)	0.044*

% Sedentary: t(1304) = 1.23; % Light PA: t(1304) = -0.54; % Moderate PA: t(1304) =-2.33; % Vigorous PA: t(1304) = -1.08; % MVPA: t(1304) = -1.80.
* $p<.05$.

3. Does physical activity, measured by direct observation, differ during an indoor lesson versus an outdoor lesson?





Children move more & engage in more varied postures during garden-based lesson compared to indoor classroom lesson.

3. Does physical activity, measured by direct observation, differ during an indoor lesson versus an outdoor lesson?

Physical activity (accelerometry) data by intervention / control and pre-garden (Wave 1) to post-garden (Waves 2, 3, 4) (N=117)

	Outdoors	Indoors	
PARAGON Activity Category	Mean (SE)	Mean (SE)	p-value
Lying	.73 (.50)	.05 (.50)	0.108
Sitting	14.06 (3.68)	84.38 (3.68)	<.0001***
Kneeling	9.90 (2.28)	0.89 (2.28)	<.0001***
Standing	52.80 (2.67)	9.44 (2.67)	<.0001***
Squatting	6.51 (1.46)	1.01 (1.46)	<.0001***
Walking	14.09 (2.12)	3.10 (2.12)	<.0001***
Very Active	2.28 (0.71)	0.11 (0.71)	<.0001***
*** p<.0001			

CONCLUSIONS

- Children at schools with gardens report a reduction in usual sedentary behaviors. *This suggests that gardening may contribute to a reduction in "screen time" and other sedentary behaviors.*

- School gardens lead to increased moderate physical activity during the school day. *Although typically children spent just 1-2 hours in the garden per week, there was an effect on PA.*

- Children move more and sit less during outdoor garden lesson versus indoor, classroom lesson; *suggesting more integration of gardens with curriculum can yield even stronger effects.*

NEXT STEPS / FUTURE RESEARCH

- Is time outdoors a mediator?

  School gardens → Time Outdoors → Physical Activity

- Do school garden programs serve as a catalyst, leading to home gardening?

- What are the educational outcomes of school gardens? Are they synergistic with effects on physical activity?

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Measuring children's dietary intake