L.A. sprouts

A School-Garden Based Randomized Controlled Nutrition, Cooking and Gardening Intervention

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Rationale for gardening

- Provides access to fresh, tasty produce at low cost
- Teaching children about the origins of food may make them more aware of healthy food choices
- Appropriate for all ages, races/ethnicities, SES
- Gardening programs in schools can:
  - Increase exposure to fruits & vegetables
    - Increase preference, motivation, self-efficacy
    - Increase intake of fruits and vegetables
  - Decrease obesity and blood pressure (LA Sprouts Pilot)

Importance of fruit & vegetable intake

- 1% of US children meet recommendations for fruit and vegetable intake
- Vegetable intake is associated with decreased adiposity and risk for diabetes in Latino youth
- In adults and children, fruit and vegetable consumption is linked to decreased
  - Metabolic syndrome
  - Cancer risk and mortality
  - Heart disease

Research Objective

Determine the impact of LA Sprouts on dietary intake, obesity parameters, metabolic disease risk and diet-related behaviors among low-income, primarily Hispanic/Latino 3rd-5th grade students in Los Angeles.

LA Sprouts: 2012-2014

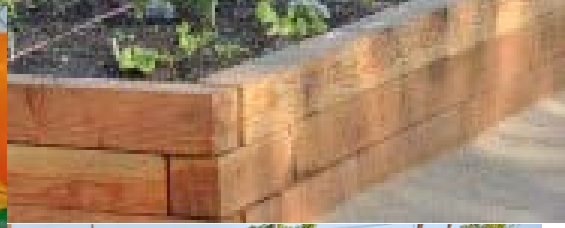
- Randomized controlled trial
  - 2 intervention schools (Monte Vista & Loreto)
  - 2 control schools (Sierra Park & Euclid) (delayed intervention)
- Gardens installed at schools in food desert neighborhoods
- Culturally-tailored curriculum
- Taught to 3rd-5th graders during LA's BEST after school hours
- Bi-monthly family workshops
- Pre and post intervention measures

Intervention Rationale

- Specific focus
  - Total sugar is prominent source of dietary metabolic risk in Latino youth
- Behavior change
  - With increased self-confidence, children will engage in positive behaviors outside of class (Bandura 1977)
- Previous garden-based studies
  - Not experimental
  - Effect on dietary intake, attitudes, preferences
  - Do not include obesity, metabolic parameters

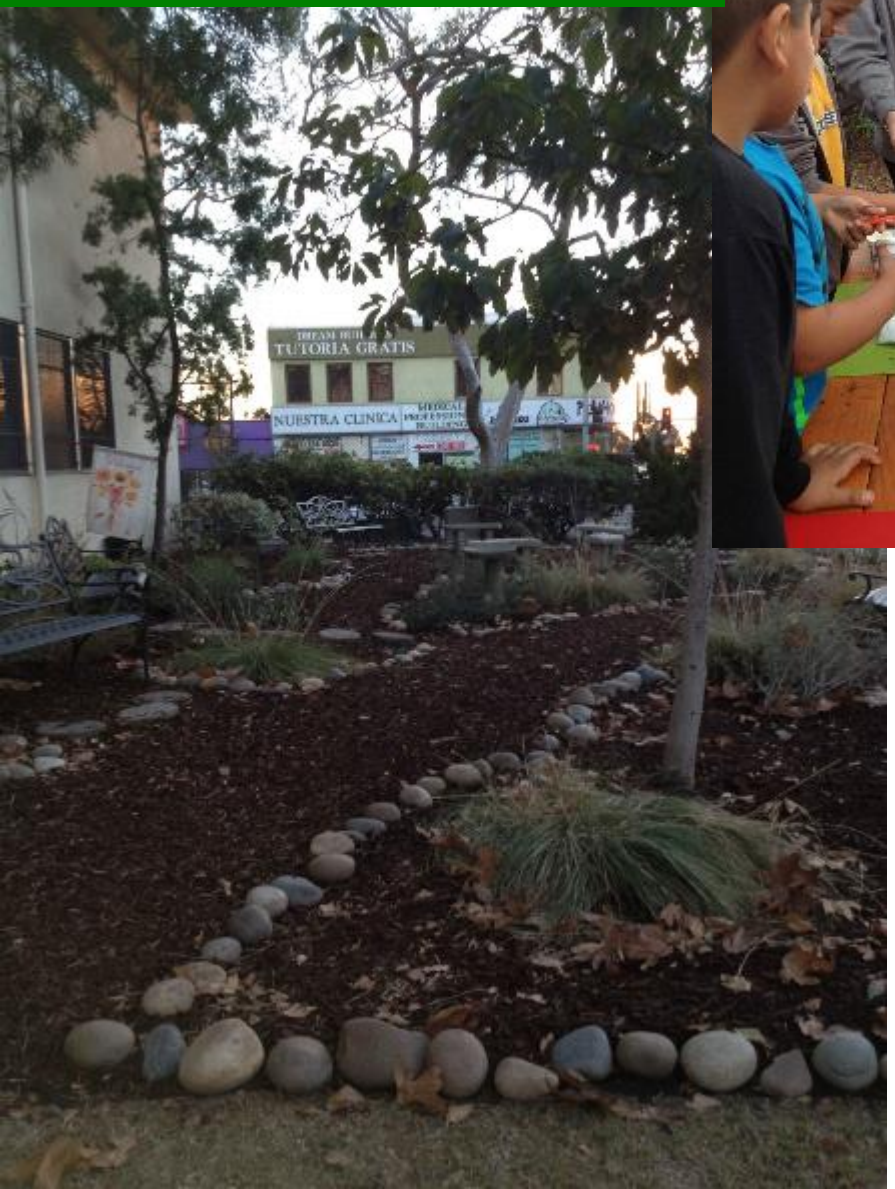
Monte Vista Elementary

WELCOME TO
Monte Vista
LA SPROUTS



Loreto Elementary

Euclid Elementary School



Sierra Park Elementary School

Curriculum

- 12 week program, 90 minutes per week, each grade level
  - Gardening lessons (45 minutes)
    - Seed to harvest
    - Emphasized environmental stewardship
    - Based on existing curricula
  - Nutrition lessons (45 minutes)
    - Developed from evidence-based nutrition studies
    - Focus on decreasing intake of sugar sweetened beverages & processed foods
    - Focus on dietary fiber – increasing fruits & vegetables
    - Family-style meals, sit-down eating
  - Every lesson included hands on gardening and cooking activities

ALL ABOUT VEGETABLES

What is a vegetable?
A vegetable is a part of a plant that you can eat. Vegetables come in different sizes, shapes and colors. Vegetables also contain vitamins, potassium, fiber, and other important nutrients. Like fruits, they give you energy to play and nutrients to stay strong.

What parts of the vegetable can you eat?
There are many different parts of plants that you can eat. Here are some examples:

- *Roots*, like carrot and beet
- *Stems or stalks*, like celery and asparagus
- *Leaves*, like kale and spinach
- *Seeds* like lima beans and peas

It is important to eat a variety of colorful vegetables every day. Dark leafy greens and bright red, yellow, and orange vegetables have the most nutrients!

Dark Green Vegetables (like bok choy, spinach, broccoli, kale):
- Contain great sources of vitamin C, K, E, and B, as well as iron, calcium, and fiber. The darker the color, the more nutrients there are.
- Are great for our skin, hair, and nails
- Contain anti-oxidants, which boost our immune system and prevent cancer

Bright Vegetables (like peppers, butternut squash, carrot):
- Contain an antioxidant known as beta carotene
- Have minerals like folate and potassium
- Are high in vitamins A and C

Starchy vegetables, like corn and potatoes, should not be chosen as often. They have more calories and less vitamins and minerals, compared to other vegetables.

VEGETABLE QUESADILLAS

Ingredients		Time: 15 minutes
1	Corn tortilla (8 inches)	Makes 1 serving
1 oz	Cheese, such as cheddar or mozzarella	
¼ cup	Vegetables (such as cauliflower, onion, broccoli, bell peppers, spinach), diced	
	Salsa	
1	Tomato, diced	
¼	Onion, diced	
½	Jalapeno, minced	
½	Lime, juiced	
2 sprigs	Cilantro	
	Salt and pepper to taste	

Directions

1. Heat both sides of the tortilla on the stove.
2. Add cheese and vegetables to ½ of the tortilla.
3. Fold the tortilla in half, and cook on both sides until the cheese has melted.
4. Mix all ingredients for the salsa together in a bowl.

On your own:

- Try a new vegetable, and help your family prepare it.
- Write about this in your journal or online.

ALL ABOUT FIBER

What is fiber?
Fiber is found in the plants we eat. It is the part of plant that we cannot digest. It is important to have a high fiber diet to maintain good health.

Fiber helps lower blood cholesterol and blood sugar levels. It also improves digestion. Eating more fiber helps you feel full, so you don't overeat.

Whole fruits have fiber, but juice does not.
The skin and pulp of the fruit contains a lot of fiber and many other important nutrients. Juicing removes the skin and pulp from the whole fruit, removing most of the fiber and many of the nutrients.

What do you think is healthier: A whole orange or orange juice?

Nutrition Comparison		
	Fresh-squeezed Orange Juice (1 cup)	**Medium Orange**
Calories	**112**	**80**
Sugar	**25g**	**14g**
Fiber	**Less than 1g**	**7g**

- Which has more fiber, the juice or the orange?
- When an orange is squeezed, what part of the orange is left behind?
- About how many medium oranges do you need to make 1 cup of juice?
- Which has more sugar?
- What is better to have, orange juice or an orange?

FRUIT RAINBOWS

Now it's your turn to make a delicious fruit rainbows! In front of you are several kinds of fruits. Place the fruits in color order, like a rainbow. Use the yogurt (or cottage cheese) as clouds!

Ingredients		Time: 10 minutes Makes 3-4 servings
½ cup	Purple fruit (like figs or red grapes)	
½ cup	Blue fruit (like blueberries)	
½ cup	Green fruit (like kiwi, honeydew melon)	
½ cup	Orange fruit (like oranges or mango)	
½ cup	Yellow fruit (like pineapple or banana)	
½ cup	Red fruit (like watermelon or strawberries)	
1 cup	Plain, low-fat vanilla yogurt or cottage cheese	

Directions

1. Wash all fruits.
2. Cut the larger fruit into cubes.
3. Place the fruit into rows, according to rainbow color order.
4. Use the yogurt or cottage cheese as clouds.

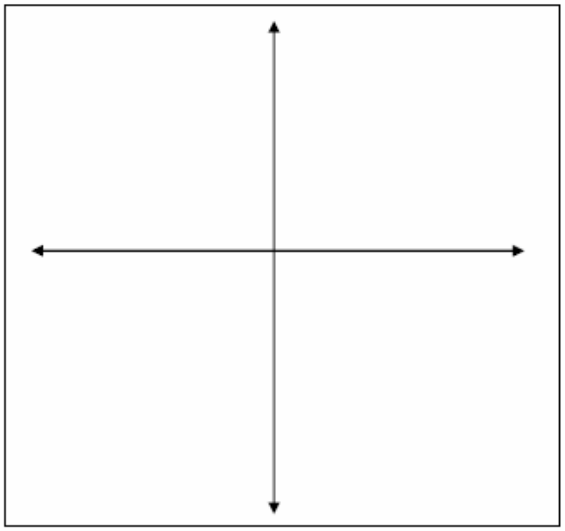
Is there enough sun where I want to grow my vegetables?

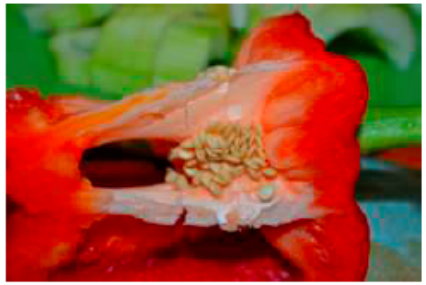
- Fall and winter vegetables need 4-6 hours of direct sunlight.
- Spring and summer vegetables need 6-8 hours of direct sunlight.

North, South, East, and West: Which direction is best?

We know that the sun rises in the east and sets in the west. Fruits and vegetables in your garden will be planted in rows from east to west, where plants on the eastern side of the garden will absorb the most sun. You can also plant rows from north to south for even sunlight. Taller plants such as fruit trees or corn should be planted in the northern part of your garden. This way they do not block the sunlight of the smaller plants, such as berries or lettuces.

Activity: Draw in your favorite fruits and vegetables in the space provided to the right. Remember that taller plants should be planted in the northern part of your garden.





Exercise in seed saving

Remember our delicious and beautiful pepper? Let's learn how to save its seeds so we can plant them next season!

<u>To save your own pepper seeds:</u>

1. Cut open the pepper.
2. Separate the seeds from the rest of the pepper.
3. Lay the seeds on a flat surface such as a cookie sheet to dry.
4. Place the seeds in a warm, dry area that gets plenty of air.
5. When dry, place the seeds in a small envelope. Label the envelope so you know its contents; note the date and any other information that is important.
6. Store your seeds in a place that is cool, dry and dark.

Exercise: How to make a deep watering can out of a two liter empty bottle.

- Remove the cap.
- Cut off the bottom of the bottle with scissors.
  (Please ask an adult to supervise)
- Turn the bottle upside down.
- Set the spout into the ground or pot.
  (About 6 inches deep)
- Fill with water.

This method will allow deep vegetable roots to get watered.

Pre- and Post-Intervention Measures

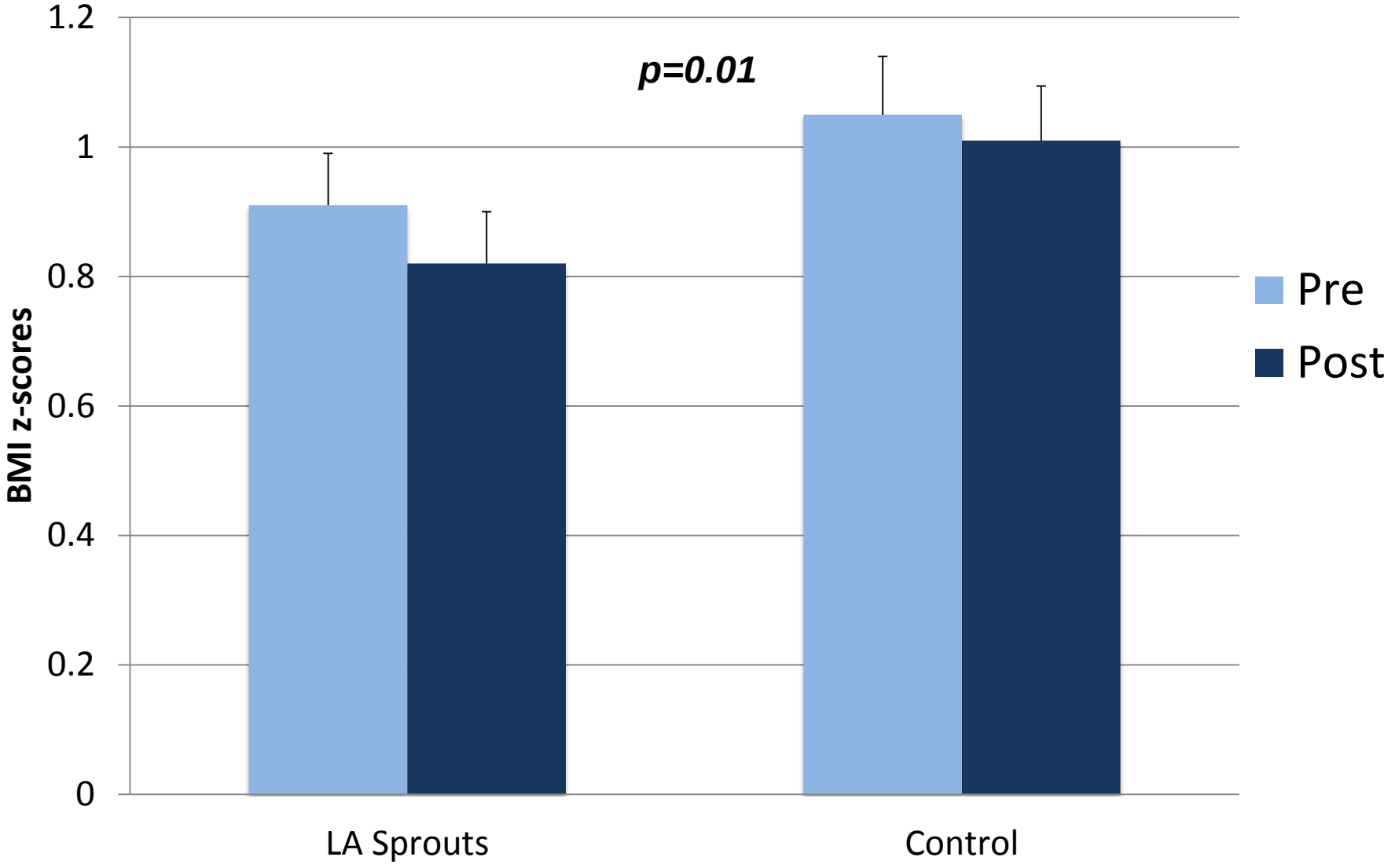
- Clinical measures
  - BMI, BMI Z-score
  - Waist circumference
  - Percent body fat (bioelectrical impedance)
  - Blood pressure
  - Fasting blood sample: glucose, lipids, insulin
  - Metabolic syndrome (Cook et al. 2003)
- Dietary intake
  - Block Kids Food Screener (last week)
- Questionnaire
  - Acculturation
  - School Engagement
  - Motivation, preferences and self-efficacy to eat fruits & veggies

Table 1: Demographic characteristics of LA Sprouts and control participants at baseline

Characteristic, n (%) or mean ± SD	LA Sprouts (n=173)	Controls (n=147)	p-value[a]
	Pre	Pre	
Male	82 (47.7)	71 (48.3)	0.91
Hispanic/Latino	153 (89.0)	127 (88.8)	0.97
Age, years	9.3 ± 0.9	9.3 ± 0.9	0.9
Height, cm	135.0 ± 8.5	135.0 ± 8.5	0.96
Weight, kg	36.9 ± 10.6	38.1 ± 12.6	0.30
BMI, kg/m^2	19.8 ± 4.1	20.6 ± 4.6	0.13
Overweight (≥85th percentile)	82 (51.3)	73 (53.3)	0.73
Obese (≥95th percentile)	54 (33.8)	54 (39.4)	0.31
Socioeconomic factors			
No English spoken at home	48 (28.7)	27 (19.6)	0.06
No computer at home	42 (26.1)	32 (23.2)	0.56
No internet at home	39 (23.2)	32 (23.2)	0.99
Mother does not have own car	57 (34.3)	38 (27.1)	0.17
Eligible for free lunch at school	152 (90.5)	125 (89.3)	0.73

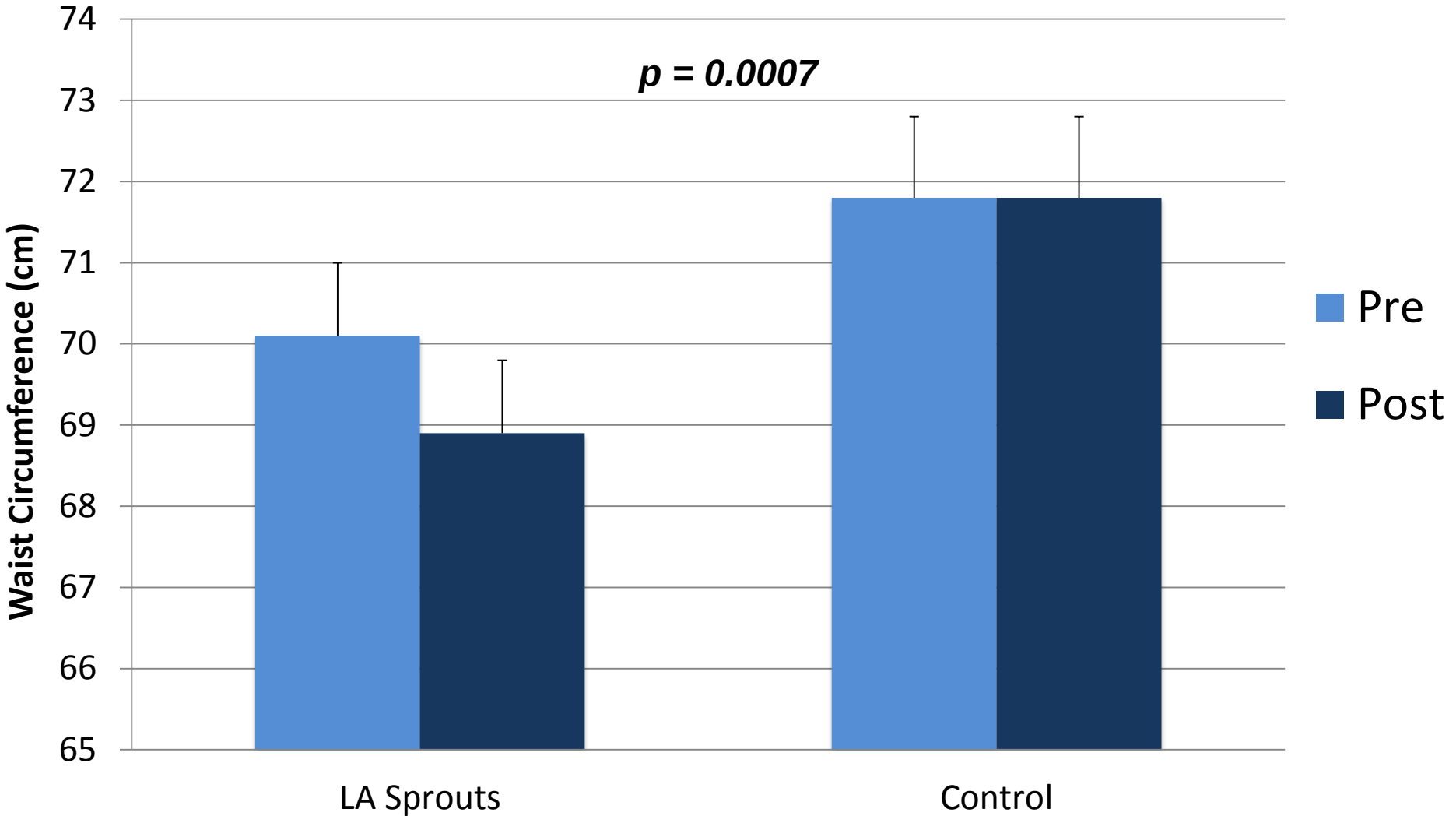
[a]p-value for difference between groups from chi-square tests (categorical variables) or independent t-tests (continuous variables).

Change in BMI Z-Score



Mean ±SE. From repeated measures ANOVA; adjusted for age (continuous), sex, ethnicity (Hispanic/Latino versus not), English spoken at home (yes, no), season (Fall, Winter/Spring)

Change in Waist Circumference



Mean ±SE. From repeated measures ANOVA; adjusted for age (continuous), sex, ethnicity (Hispanic/Latino versus not), English spoken at home (yes, no), season (Fall, Winter/Spring)

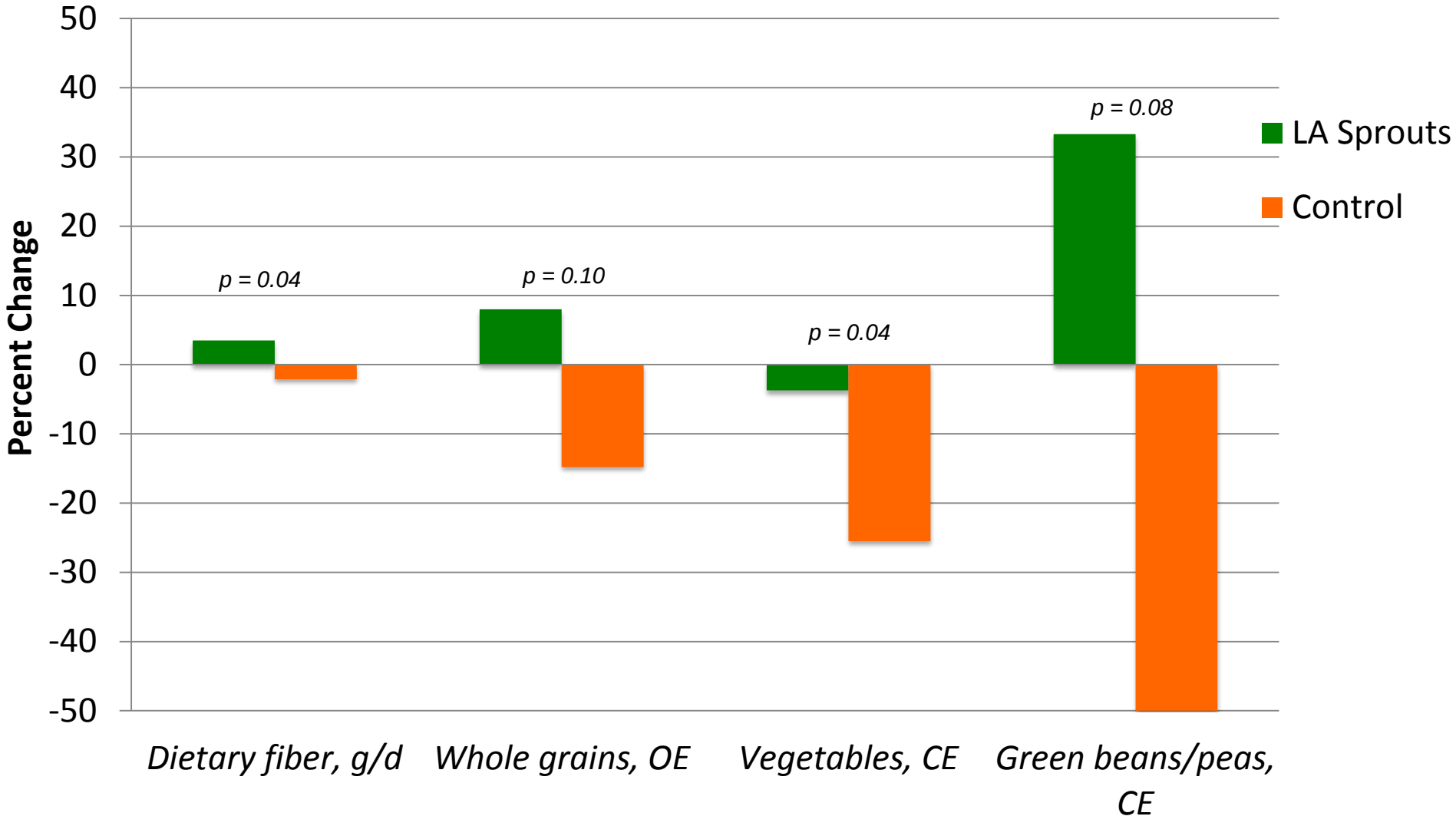
Metabolic syndrome

- Fewer LA Sprouts participants had the metabolic syndrome after the intervention than before, while the number of controls with metabolic syndrome increased.

No significant changes in

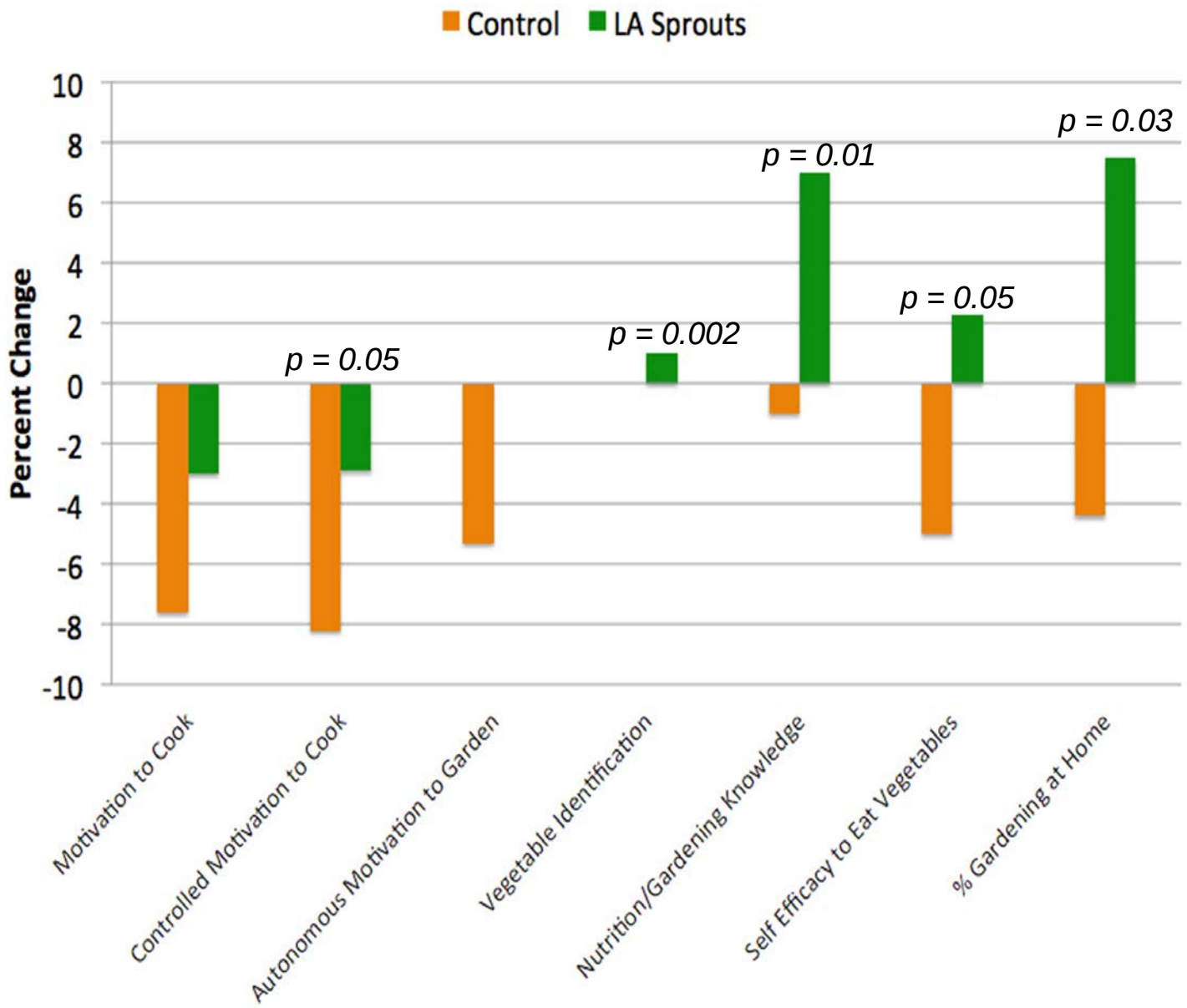
- Body fat
- Blood pressure
- Lipids, insulin or glucose (smaller sample size)

Change in Dietary Intake



Mean ±SE. From repeated measures ANOVA; adjusted for age (continuous), sex, ethnicity (Hispanic/Latino versus not), English spoken at home (yes, no), season (Fall, Winter/Spring),

Change in Dietary-related Behaviors



Summary

LA Sprouts resulted in

- Reductions in BMI & waist circumference
- Increased consumption of dietary fiber, whole grains, green beans & peas
- Improved vegetable identification, nutrition and gardening knowledge, and self-efficacy to eat vegetables
- Increased percentage of children gardening at home

Conclusions

Teaching children to grow, cook and eat fruits and vegetables improves multiple health outcomes.

Longer garden-based RCTs are warranted to understand the long-term effects on health outcomes, as well as evaluate sustainability.

School gardens can increase access to fruits and vegetables in otherwise food desert neighborhoods.

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  - Euclid ES
  - Monte Vista ES
  - Sierra Park ES
- All participating children and parents

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