LA Sprouts: A school based gardening, nutrition, and cooking program reduces obesity and related metabolic disorders in Latino youth

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http://www.lasprouts.org
Rational for Gardening

• Provides access to low-cost, fresh and tasty F&V

• Appropriate for all ethnicities/races, SES, and ages
  – “Big or small, rich or poor, fat or skinny, everyone likes to play in the dirt”

• Gardens can be put anywhere (inside containers on concrete, in window sills, on patios, in ground)
Previous Literature:

Gardeners Benefit From:

• Improved physical fitness:
  – Lee, 2002;
  – Armstrong, 2001;
  – Blair et al., 1991

• Improved food security/socioeconomic situation:
  – Brown and Jameton, 2000;
  – Tucker, 2001

• Improved social activity
  – Relf, 1973

• Education/vocational skill development:
  – Spence, 2001;
  – Relf, 1973

• Stress relief, relaxation, improved mental health:
  – Armstrong, 2001, 2001;
  – Brown and Jameton, 2000

• Improved self confidence and personal fulfillment
  – Armstrong, 2000, 2001;
  – Brown and Jameton, 2000
Gardening Programs Benefits on Health

- Increases a child’s willingness to taste vegetables\textsuperscript{1,3}
- Increases preferences\textsuperscript{2,3}
- Increase identification of fruits and vegetables (FV)\textsuperscript{3,4}
- Improved attitudes toward FV\textsuperscript{3}
- Increased self-efficacy to eat FV\textsuperscript{5}
- Improved dietary knowledge\textsuperscript{6}
- Increased physical fitness and physical activity\textsuperscript{6}
- Increased consumption of FV\textsuperscript{5-9}

\textsuperscript{1} Morris California Agriculture 2001; \textsuperscript{2} Morris and Zidenberg-Cherr JADA 2002; \textsuperscript{3} Ratcliff 2011; \textsuperscript{4} Somerset 2009; \textsuperscript{5} Gatto and Davis 2012; \textsuperscript{6} Parmer 2009; \textsuperscript{7} Wells 2014; \textsuperscript{8} McAleese JADA 2007; \textsuperscript{9} Hermann 2006
Edible Schoolyard (ESY)

Founder: Alice Waters
Edible Schoolyard (ESY) Berkeley

• 17 years ago: Martin Luther King Jr. MS
• Small grant from the Center for Ecoliteracy:
  – 1\textsuperscript{st} year:
    • First full-time garden director
    • > 1 acre asphalt was cleared, and garden boxes were built
  – 3\textsuperscript{rd} year:
    • Kitchen Director
    • Teacher liaisons to develop and teach lessons
  – 5\textsuperscript{th} year:
    • Program coordinator and 8 staff hired
    • Weekly garden and kitchen lessons
Chez Panisse Foundation

• 1996 – Alice Waters created the Chez Panisse Foundation

• Creation of a public school curriculum that includes hands-on experiences in school kitchens, gardens, and lunchrooms and provides healthy, freshly prepared meals

• Partnership with Berkeley Unified School District and Center for Eco-literacy
  – Curriculum and food now served at all 16 schools in district and provides >10,000 meals per day.
School Gardening Programs – Edible Schoolyards (founder Alice Waters)
• Conducting RCT with:
  – 4 elementary schools randomized by region
    • 2 intervention schools (n=200)
    • 2 control schools with delayed intervention (n=200)
  – 12-week afterschool nutrition, gardening, & cooking curriculum
  – Bimonthly parental workshops
  – Gardens built at school
  – Added blood measure to assess glucose, insulin, and lipids
Pre/Post Measures:

• Anthropometrics: Height, Weight, BMI parameters, Waist circumferences
• Body fat via Tanita BIA
• Blood pressure
• Optional fasting blood sample (glucose, insulin, lipids)
• Dietary intake via Block Kid Screener
• Determinants of dietary behavior via questionnaire packet:
  – Nutrition/gardening knowledge;
  – Motivation to eat/cook/garden FV;
  – Intention to eat FV;
  – Preference for FV;
  – Self efficacy to eat/cook FV;
  – School engagement;
  – Gardening habits at home
Assessed for eligibility (n=409)

- Enrollment
- Excluded (declined to participate, n=34)

Randomized (n=375)

- Assigned to intervention (n=204)
  - Received intervention & baseline data collected (n=198)
    - Fasting blood sample obtained (n=97)
  - Did not receive intervention (n=6 withdrew from after-school program)

- Assigned to control (delayed intervention) (n=171)
  - Participated as control & baseline data collected (n=166)
    - Fasting blood sample obtained (n=72)
  - Did not participate as control (n=5 withdrew from after-school program)

Follow-Up

- Lost to follow-up (n=31; n=30 withdrew from after-school program, n=1 absent on all data collection days)

Analysis

- Both baseline & follow-up data available for main outcomes analysis (n=173)
  - Both pre & post blood sample collected (n=67)

- Lost to follow-up (n=24 withdrew from after-school program)

Analysis

- Both baseline & follow-up data available for main outcomes analysis (n=147)
  - Both pre & post blood sample collected (n=46)
Table 2. Validation of Determinants of Dietary Behavior Questions Used in Questionnaire Packet

<table>
<thead>
<tr>
<th>Item</th>
<th>Items, n</th>
<th>Internal Consistency</th>
<th>Intra-Rater Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation to eat FV</td>
<td>7</td>
<td>0.809</td>
<td>0.665</td>
</tr>
<tr>
<td>Motivation to garden</td>
<td>9</td>
<td>0.858</td>
<td>0.739</td>
</tr>
<tr>
<td>Motivation to cook FV</td>
<td>7</td>
<td>0.850</td>
<td>0.635</td>
</tr>
<tr>
<td>Self-efficacy for FV consumption and related behaviors</td>
<td>14</td>
<td>0.883</td>
<td>0.478</td>
</tr>
<tr>
<td>Fruit neophobia</td>
<td>6</td>
<td>0.800</td>
<td>0.521</td>
</tr>
<tr>
<td>Vegetable neophobia</td>
<td>6</td>
<td>0.901</td>
<td>0.542</td>
</tr>
<tr>
<td>Preferences for fruit</td>
<td>10</td>
<td>0.809</td>
<td>0.722</td>
</tr>
<tr>
<td>Preferences for vegetables</td>
<td>15</td>
<td>0.866</td>
<td>0.575</td>
</tr>
<tr>
<td>Cooking and gardening attitudes</td>
<td>8</td>
<td>0.842</td>
<td>0.912</td>
</tr>
<tr>
<td>Nutrition and gardening knowledge</td>
<td>8</td>
<td>0.472</td>
<td>0.400</td>
</tr>
</tbody>
</table>

FV indicates fruit and vegetables.

The researchers used Cronbach alpha to determine interval consistency (n = 350) and correlations to evaluate intra-rater reliability (n = 19). All questionnaire items had 4 response options, with the exception of demographic questions and current home gardening practices, which ranged from 2 to 7 response options (not included in psychometric tests).
### Table 1: Demographic characteristics of LA Sprouts and control participants at baseline

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>LA Sprouts (n=173)</th>
<th>Controls (n=147)</th>
<th>p-value†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristic, n (%) or mean ± SD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>82 (47.7)</td>
<td>71 (48.3)</td>
<td>0.91</td>
</tr>
<tr>
<td>Hispanic/Latino*</td>
<td>153 (89.0)</td>
<td>127 (88.8)</td>
<td>0.97</td>
</tr>
<tr>
<td>Age, years</td>
<td>9.3 ±0.9</td>
<td>9.3 ±0.9</td>
<td>0.9</td>
</tr>
<tr>
<td>Height, cm</td>
<td>135.0 ±8.5</td>
<td>135.0 ±8.5</td>
<td>0.96</td>
</tr>
<tr>
<td>Weight, kg</td>
<td>36.9 ±10.6</td>
<td>38.1 ±12.6</td>
<td>0.3</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>19.8 ±4.1</td>
<td>20.6 ±4.6</td>
<td>0.13</td>
</tr>
<tr>
<td>Overweight (≥85th percentile)</td>
<td>82 (51.3)</td>
<td>73 (53.3)</td>
<td>0.73</td>
</tr>
<tr>
<td>Obese (≥95th percentile)</td>
<td>54 (33.8)</td>
<td>54 (39.4)</td>
<td>0.31</td>
</tr>
<tr>
<td>Socioeconomic factors</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No English spoken at home*</td>
<td>48 (28.7)</td>
<td>27 (19.6)</td>
<td>0.06</td>
</tr>
<tr>
<td>No computer at home</td>
<td>42 (26.1)</td>
<td>32 (23.2)</td>
<td>0.56</td>
</tr>
<tr>
<td>No internet at home</td>
<td>39 (23.2)</td>
<td>32 (23.2)</td>
<td>0.99</td>
</tr>
<tr>
<td>Mother does not have own car</td>
<td>57 (34.3)</td>
<td>38 (27.1)</td>
<td>0.17</td>
</tr>
<tr>
<td>Eligible for free lunch at school</td>
<td>152 (90.5)</td>
<td>125 (89.3)</td>
<td>0.73</td>
</tr>
</tbody>
</table>
Significant Changes in Health Outcomes

- BMI z-scores
- Waist circumferences
- Metabolic Syndrome

Gatto NM et al. Pediatric Obesity 2016 (in press)
Significant Changes in Dietary Intake

The graph shows the percent change in dietary intake for two groups: Control and LA Sprouts. The nutrients measured include:

- Dietary fiber (g/d)
- Whole grains (oz/d)
- Vegetables (cup/d)
- Green beans (cup/d)

The changes are represented on the y-axis with a range from -60 to 40 percent. The graph indicates that LA Sprouts had a significant increase in the consumption of green beans compared to the Control group.
Significant Changes in Determinant of Dietary Behavior

- Identification of FV
- Nutrition and Gardening Knowledge
- Garden at Home

Percent Change

- Control
- LA Sprouts
Conclusions from LA Sprouts

• First RCT garden based trial to result in:
  – Reductions in obesity, waist circumference and Met Syndrome
  – Increased dietary fiber, vegetables and whole grain intake
  – Improved determinants of dietary behavior

• Longer RCTs (>12 months) are warranted to understand the long-term health effects and the sustainability concerns.
Next Analyses for LA Sprouts

• Analyzing changes in parent data and the influence of those changes on child outcomes;
• Food insecurity and acculturation analyses;
• Examining the link between baseline and changes in cooking self efficacy and attitudes on baseline and changes in health outcomes
Key Strategies:

• Involve stakeholders in planning, development, and implementation
• Heavy emphasis on cooking activities/lessons
• Provide educators or gardeners to teach the lessons
• Include parental components/lessons
• Provide “Train the trainers” workshops and toolkits to the schools
• Media promotion around garden

Davis and Somerset; Public Health Nutrition; 2015
A school-based gardening obesity intervention for low-income minority children

PI: Jaimie Davis

NIH: NHLBI (1R01HL123865)
Collaborators

UTHealth

The University of Texas
Health Science Center at Houston

THE UNIVERSITY OF TEXAS
AT AUSTIN

Seton Medical Center
Member of Daughters of Charity Health System

TEXAS A&M AgriLIFE
Teaching • Research • Extension • Service

AgriLIFE EXTENSION
Texas A&M System
Travis County

Sustainable Food Center
Overall Goal

To develop and test the effects of a 1-year in-school gardening, nutrition, and cooking intervention on improving dietary intake and reducing obesity parameters in Hispanic 3rd-5th graders and their families.
AIMS

• To test the effect of the TX Sprouts intervention on the following changes in health outcomes for the child:
  a. Fruit and vegetable intake;
  b. Determinants of dietary behavior;
  c. Anthropometric parameters (e.g., BMI, WC, percent body fat);
  d. Metabolic risk factors (e.g., blood pressure, fasting glucose);
  e. Home environment (e.g., availability and accessibility of FV);
  f. Academic performance (grades and time on task)
  g. Physical Activity
Aims – cont.

• To test the effects of the TX Sprouts intervention on changes in dietary intake and related dietary determinants of the parents.

• **Exploratory Aim:** Identify success of strategies to sustain long-term garden programs in schools.
Program Design

• 16 schools will be randomized to either:
  – TX Sprouts (n=8 schools)
  – Delayed intervention (n=8 schools)

• Each school will get a edible garden (~$5K per site):
  – Designed with feedback from stakeholders at each school
  – Design features included:
    • 5-6 teaching garden beds
    • Outdoor teaching area with benches/tables
    • Storage units, with gardening/cooking supplies

• Curriculum used: Expansion of LA sprouts:
  – 18 lessons taught during school hours across the school year
  – 9 monthly classes for parents/families
Garden Leadership Committees

- Formed year before intervention starts
- Made up of admin, teachers and parents (PTA reps, CATCH champions, Wellness Committees)
- Will lead planning/build of the school garden
- Will receive trainings from Sustainable Food Center on school garden management in 1st year
- Master Gardeners from Travis County Extension will assist and work with the GLCs in garden maintenance
Sustainability of Garden Programs

• Sustainable Food Center will lead at least 2 more training on garden skills and garden/classroom integration.
• Travis County Master Gardeners will continue to assist GLCs with maintenance of garden for 1 year after intervention – 10 hrs a week
• TX Sprouts staff will provide a tool kit and training to all teachers
• Evaluation will include:
  – Structured interviews with teachers and GLC members
  – School observations of strategies implemented to sustain program
Garden Builds! Oak Meadows Elementary
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