Engineering Physical Activity and Well Being into the Playground
TODAY’S PRESENTERS

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SENIOR ARCHITECT
RAINFORTH GRAU ARCHITECTS
MARCI RANEY, PhD

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Occidental College
National Physical Activity Trends

- 1/5 of US schools meet P.E. requirements (200min every 10 days)
- <50% of elementary school students that live within 1/4 mile from school walk or bike
- During school hours, boys and girls have fewer breaks in sedentary time than during any other weekday or weekend period
- Media consumes significant time at home
  - 2.3-3.5 hours/day (≤ 8 years)
  - >7.5 hours/day (8-18 years)
LA COUNTY CHILDHOOD STATISTICS

- **Physical Activity habits (6-17yrs)**
  - 23% watch more than 3 hours TV / day
  - 28.7% meet physical activity recommendations each week
  - 10.9% are completely sedentary

- **Health Outcomes**
  - >25% LA County students are obese
  - Obesity negatively correlated with neurocognitive functioning
  - Obese children 7 – 10x more likely to become obese adults
GREEN SPACE
Access in Los Angeles

- Median **3.3** acres of park space/1000 people
- >94% of public park infrastructure is in poor or fair condition
- 30% of LA residents live within walking distance of a public park
- 20% LAUSD playgrounds are paved surfaces with 0% tree coverage
- 4.1% average tree canopy coverage on play areas
Potential Solution

Add green space to public schoolyards where children spend most sunlit hours

MVPA on school playgrounds has been linked to the playground design (Bohn-Gettler & Pellegrini, 2014; Institute of Medicine, 2013)

Students spend more time sedentary on solid surfaces (Anderson et al., 2015; Barton et al., 2015; Foster, 2012)

Natural spaces are associated with greater perception of safety, playground cohesiveness, less boredom, and fewer bullying incidences (Bates et al., 2018; Hyndman, 2015)
POTENTIAL IMPACT

In California alone, over 10,000 public schools serve 6.2 million students on 130,000 acres of public land.
Subjects

- Control (n=393) and Experimental (n=538) Title I schools
- 1st-6th grade students

Intervention (Los Angeles Beautification Team)

- Large-scale greening project at experimental location
- Grass field + trees, outdoor classroom

Schoolyard Greening Study

- **Methods**
  - Data collection at recess
    - Pre, Post, 4-mo. follow-up,
      16-mo. follow-up
  - Direct observation
  - Accelerometer Wear

ZONE PREFERENCE

- **Most Popular**
  - **Baseline:** handball (18.8%), 4-square/dodgeball (16.5%), asphalt fields (16.9%)
  - **Post, 4 and 16-month follow-up:** grass field (15.5 – 27.2%), non-designated green space (mulch, trees, boulders) (17.5 – 25.0%), outdoor classroom (11.8 – 15.2%)

- **Least popular baseline, post, 4 and 16-month follow-up**
  - **Girls:** kickball, basketball (1.3 – 6.0%)
  - **Boys:** play structure, tetherball, volleyball (2.0 – 5.1%)
STUDENTS OBSERVED
In Zones Replaced with Green Space

% of all students on playground

baseline (no greenspace)  post  4-month follow-up  16-month follow-up

Girls  Boys
Population activity levels were similar between control & experimental at baseline & did not change for control throughout study

33 – 40 experimental students previously sedentary during single recess period are now active
Activity preference was similar between control & experimental at baseline & remained stable throughout the study at control location.
ACTIVITY MODE
And Population Activity Levels

* Significantly different than traditional playground games, $p<0.05$
Activity Changes

Individual Activity Level Changes

- Activity levels significantly greater than baseline at all post-greening time periods; greatest difference for 5th graders
- Renovations have allowed students to accumulate **20 – 30 additional** weekly minutes in moderate-to-vigorous physical activity at recess
SURFACE TYPE
And Individual Activity Level

*Significantly different than opposite sex for same surface, $p<0.05$
**Significantly different than hardscape for same sex, $p<0.05$

Active Recess Minutes

- girls
- boys

- hardscape
- greenspace
**SURFACE TYPE**
And Group Size

Negative correlation between time spent in large groups (10+ people) and individual vigorous intensity activity, $p<0.05$

*Significantly different than hardscape, $p<0.05$
Positive correlation between prosocial behavior and amount of time spent in small groups (2 – 4 people)
**ANTISOCIAL INTERACTIONS**

*Significantly different than control location and different than baseline, p<0.05*
Green Space Impacts between Playgrounds

87,834 sq. ft
328 students
**green space: 28%**

88,027 sq. ft
106 students
**green space: 50.1%**
# Green Space Impacts between Playgrounds

<table>
<thead>
<tr>
<th></th>
<th>#1</th>
<th>#2</th>
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<tbody>
<tr>
<td>Open Grassy Field</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Open Asphalt Field</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Woodchip Area</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Trees within schoolyard</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Kickball</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Handball</td>
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<td>X</td>
</tr>
<tr>
<td>4 Square/Dodgeball</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Basketball</td>
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<td>X</td>
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<tr>
<td>Tetherball</td>
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<tr>
<td>Volleyball</td>
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<tr>
<td>Track Lanes</td>
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<tr>
<td>Play Structure</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Outdoor Classroom</td>
<td>X</td>
<td></td>
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<tr>
<td>Painted Hardscape</td>
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ACTIVITY LEVELS
% Students Active on the Playground

Significant difference relative to 1st-3rd (a); #1 (b)
SURFACE TYPE
And Individual Activity Level

Recess Time Spent Sedentary

Significant difference relative to girls (a), hardscape (b), #2 (c)
CONCLUSIONS

- Replacing large areas of asphalt with green space in urban schoolyards have the potential to:
  - \( \uparrow \) opportunities for children to interact with nature
  - Improve population and individual physical activity levels, particularly MVPA, in sex- and age-dependent ways
  - Improve social cohesiveness and decrease inter-student conflict

- \( \uparrow \) green space alone may not be adequate to address physical activity and obesity concerns for low-income urban students
  - Play areas designed to challenge motor skills, but are not designed for sport, are critical to eliminating gender gap
  - As children age, relative importance of diverse play options on the playground \( \uparrow \)
ACKNOWLEDGEMENTS

- LAUSD students, parents, & school officials
- Los Angeles Beautification Team
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- Bevin Ashenmiller
- My undergraduate research team
JOHN KRUSE

Physical Education Adviser

Los Angeles Unified School District
The goal of physical education is to develop physically literate individuals who have the knowledge, skills and confidence to enjoy a lifetime of healthful physical activity.

--Society of Health and Physical Education (SHAPE America)
Engineering human movement out of our lives.
We start young...
The cage isn’t needed as we get older.
The cycle continues into adulthood.
How Can We Engineer Physical Activity Back In?
Physical education is the sequential *educational program* that teaches students to:

- Understand & participate in regular physical activity that assists in developing and maintaining physical fitness throughout their lifetimes.
- Understand and improve their motor skills.
- Enjoy using their skills and knowledge to establish a healthy lifestyle.
- Understand how their bodies work.
Education Includes Four Components

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<th>Assessment</th>
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<tr>
<td><strong>What</strong></td>
<td>How do we know?</td>
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<tr>
<td><strong>Instruction</strong></td>
<td><strong>Environment</strong></td>
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<td><strong>How</strong></td>
<td><strong>Surroundings Conditions</strong></td>
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</tbody>
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Physical Activity vs. Quality Physical Education

Physical Activity (PA)

- Any bodily movement above rest.

- Guidelines refer to the subset of physical activity that enhances health.

Source: Centers for Disease Control & Prevention

Physical Education

- is the sequential educational program that teaches students to:
  - develop and maintain physical fitness throughout their lifetimes.
  - improving their motor skills.

- Enjoy using their skills and knowledge to establish a healthy lifestyle.

- Understand how their bodies work.
The Content of Physical Education is science-based...

...with a practical application!

- Physics
  - Biomechanics

- Biology
  - Physiology
  - Exercise Physiology

- Psychology
  - Sociology of PA
  - Motor Behavior
  - Psychology of Exercise & PA

- Exercise Physiology
LEONA KETTERL, AIA, ALEP, LEED, BD+C

Senior Architect

Rainforth Grau Architects
Cool coatings

Shading via trees and shelters
CONCEPTUAL SCHEMATIC SITE PLAN
LANDSCAPE ARCHITECT’S TRANSLATION
LANDSCAPE ARCHITECT’S
TRANSLATION
ENTRY

- SHADED WAITING
- BEGINS “FLOW” OF RIVER
PLANTING BEDS

- HANDS ON EXPLORATION
- RESPONSIBILITY
- GET DIRTY
SHELTER

• EDIBLE GARDEN
• OUTDOOR CLASSROOM
• CORNER OF SHELTER CANTILEVERED OVER ROCK SWALE
DRY CREEK BED
• FOSSIL HUNT
• INFORMAL SEATING
• ROCK HOPPING
QUESTIONS?