Painting Playgrounds for Movement:
Preventing Obesity in Preschool Settings

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Introduction

According to the Centers for Disease Control and Prevention, obesity rates among low-income preschool children remain over 15%

Childhood obesity is associated with cardiovascular risk factors, increased health care costs, and premature death

Children who are obese during early childhood are also likely to be obese during middle or late childhood and adulthood

Taking action to prevent obesity in low-income preschools
With a Community Grant from the California Obesity Prevention Program, the CSU Chico, Center for Nutrition & Promotion (CNAP) partnered with Glenn County Office of Education to pilot the use of inexpensive and reusable playground stencils to enhance physical activity opportunities for low income preschool children.

Playgrounds can be designed to increase levels of physical activity and energy expenditure while linking with preschool learning standards.

Stencils incorporate age-appropriate learning concepts from California Preschool Learning Foundations and include: letter, number, shape and color recognition, counting, sequencing and pathways.

Study Objective
To determine if strategically painting preschool playgrounds using reusable stencils would increase energy expenditure of preschool-aged children

Methods

Intervention

Reusable playground stencils were purchased from www.fastline.net and canned asphalt paint was purchased locally. An Exercise Physiologist with early childhood knowledge met with site teachers to design the play spaces. Teams of 5 painted the playgrounds in one day.

Stencils included a painted track for wheeled toys, a bulls-eye for tossing skills, scattered shapes and various hopscotch patterns for jumping, hopping, and leaping and ball bouncing, animals with activity words for teacher-led activities, a figure eight for balancing, and a variety of pathways for balancing and crossing the midline (brain development).

Data Collection

- Trained researchers recorded observations of physical activity in two preschool playgrounds (intervention vs. control). Baseline measurements were taken prior to stenciling.
- The intervention playground received the stenciling in areas 2, 3 and 4 (Figure 1).
- Physical activity was measured by the System for Observing Play and Leisure Activity in Youth (SOPLAY)
- Observations of physical activity in the playground took place between 9 AM and 3 PM on three separate occasions.

Following predetermined protocol, scans were made left to right in each playground for girls, boys, and type of physical activity.
Four 5-minute scanning periods were conducted for each playground (two for AM, two for PM hours), for a total of 40 minutes of observation each day.

Activity codes (sedentary, walking, and very active) were transformed to energy expenditure (EE) per person (kcal/kg/min). Transformation into EE allows these data to compare relative activity levels over time and between playgrounds.

Statistical Analysis

Dependent variable: Energy expenditure **Independent variable:** Time of measurement

- Temperature was included as a covariate
- Differences in mean EE between playgrounds were compared using repeated measures ANOVA
- Game-Howell post-hoc tests were used to specify sources of difference in multiple mean comparisons
- Validity of these physical activity measures has been established in previous studies

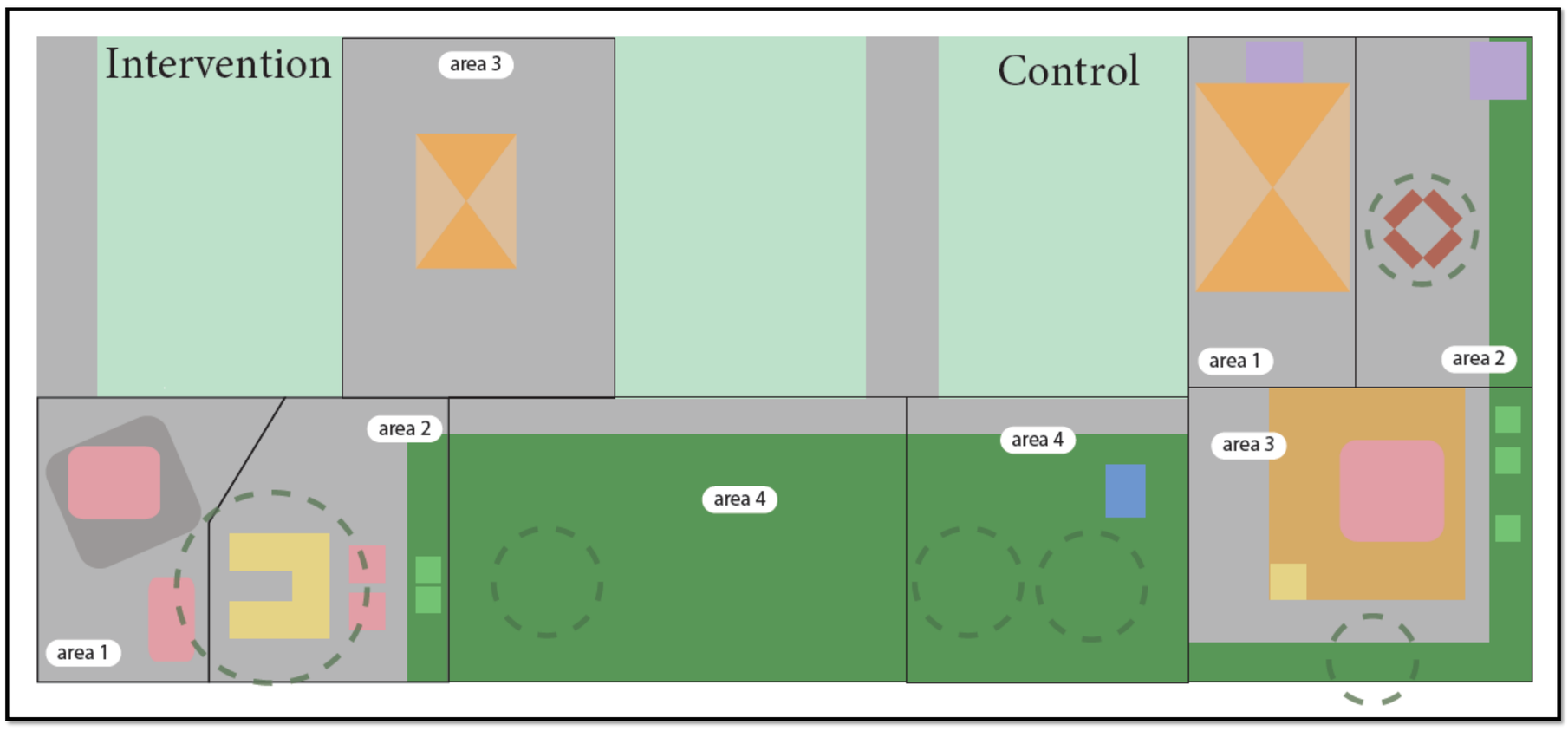

Figure 1. Playgrounds before stencil intervention

Most common activities within these areas

Intervention
Area 1 = play structure
Area 2 = sandbox
Area 3 = tricycles
Area 4 = water tables

Control
Area 1 = tricycle
Area 2 = play structure
Area 3 = water table
Area 4 = tag

Results

Table 1: Mean energy expenditure (kcal/kg/min) per playground area by intervention and control

Playground Area	Intervention Vs. Control (n)	Boys Mean (SD)	Girls Mean (SD)	All Mean (SD)
Area 1	Control (273)	0.064 (0.012)	0.038 (0.076)	0.102 (0.013)
	Intervention (192)	0.071 (0.010)	0.127 (0.162)	0.198 (0.022)
Area 2	Control (273)	0.064 (0.011)	0.041 (0.085)	0.105 (0.015)
	Intervention (192)	0.140 (0.017)	0.145 (0.016)	0.267 (0.024)
Area 3	Control (273)	0.194 (0.019)	0.092 (0.014)	0.286 (0.014)
	Intervention (192)	0.106 (0.019)	0.162 (0.019)	0.267 (0.024)
Area 4	Control (273)	0.380 (0.023)	0.125 (0.015)	0.504 (0.032)
	Intervention (192)	0.230 (0.024)	0.211 (0.022)	0.440 (0.042)
All Areas	Control (1092)	0.176 (0.021)	0.074 (0.012)	0.250 (0.029)
	Intervention (768)	0.137 (0.018)	0.161 (0.018)	0.297 (0.030)

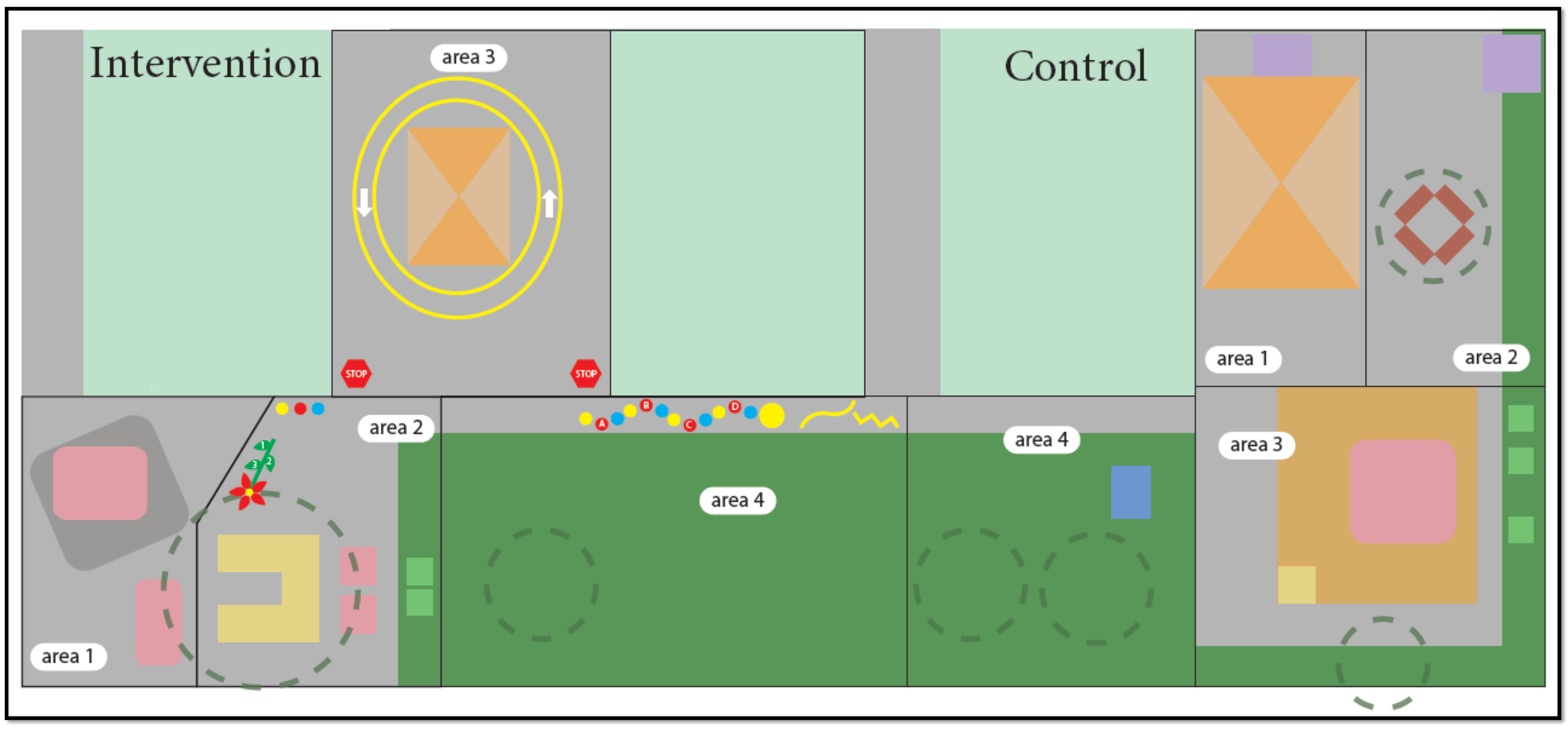

Figure 2. Playgrounds after stencil intervention

Analysis of covariance indicated no significant differences at baseline ($p = 0.494$). Following the intervention, repeated measures ANOVA revealed EE significantly increased in intervention school and not in control ($p = 0.003$).

ANCOVA tests for mean differences of EE showed intervention playground had significantly more EE than the control playground ($p < 0.001$).

Conclusion

Reusable Playground stencils are an inexpensive solution to increase physical activity for preschoolers.

The stencil intervention was successful with a significant increase in children's' energy expenditure after the playground was painted.

There are no safety restrictions as there are for climbing equipment and swings which makes them a valuable asset for any playground.