



Research Article

Small Prizes to Improve Food Selection in Inner City Elementary Schools

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Abstract

Background: Poor food selection in school cafeterias is a risk factor for childhood obesity. Previously, we described a pilot program in which healthful food selection was increased by over 100% in an elementary school cafeteria by offering small prizes if students selected a Power Plate (PP); a fruit, vegetable, plain fat free milk (PFFM) and entrée. We now describe this Power Plate Program (PPP) when expanded to 8 inner city elementary schools in Cincinnati, Ohio, US.

Methods: A "Green smiley-faced" emoticons were posted near the 4 PP items. In addition, students ages 5 to 12 were rewarded with a small prize if they selected a PP which consisted of the four healthful foods. Purchase of the healthful foods was determined by cash register receipts over the 2015-16 academic year.

Results: Overall, 330,580 lunch purchases were evaluated. Baseline purchase of PFFM was 0.14 per student and increased to 0.23, a 56% increase ($p < 0.0001$). Chocolate milk purchase decreased from 0.72 per student to 0.61 ($p < 0.0001$) and vegetable purchase increased from 1.30 to 1.42 per student (a 9.2% increase, $p < 0.0001$). Fruit purchase, however, decreased from 1.02 to 0.99 per student (a 2.9% decrease, $p < 0.0001$) and total milk sales decreased from 0.87 to 0.84 per student (a 3.6% decrease, $p < 0.0001$). All changes were significant.

Conclusion: Emoticon placement and small prizes as an incentive for healthful food purchase increased PFFM and vegetable purchase but also resulted in a small decrease in fruit and total milk selection by inner city elementary school children.

Keywords: Childhood Obesity; Food Selection; School Cafeteria

Abbreviations: CPS: Cincinnati Public Schools; PFFM: Plain Fat Free Milk; PP: Power Plate; PPP: Power Plate Program

Introduction: Childhood obesity rates remain high and continue to present a major health care challenge [1]. The US Department of Agriculture's school lunch program was developed to improve nutrition in school age children [2]. Poor food selection in school cafeterias is a risk factor for obesity and students participating in the USDA lunch program may choose lower quality items such as flavored milk over plain milk [3]. Elementary school students

prefer and consume flavored milk to plain and this can lead to increased sugar consumption [4,5].

Interventions in the school cafeteria such as convenience line for students making healthful selections, giving children friendly nicknames to food items and easy access food displays have been employed and typically increase healthful food selection by over 30% [6,7]. In 1978, the McDonald's Corporation introduced the "Happy Meal" in which a small toy was included with a packaged meal designed for children [8]. Small prizes as incentives to improve food selection have been used successfully in elementary school aged children in commercial and academic research settings [9].

Hobin et al. were able to increase selection of a packaged healthful lunch by 100% in a camp setting by offering prizes [10]. Emoticons to highlight healthful foods also improve school aged children's food choices [11,12]. Our group piloted an inner city elementary school cafeteria intervention using green "smiley-face" emoticons, highlighting preferred choices and offering a small prize such as pencils or glow sticks to those that selected a "Power Plate" (PP) by choosing a fruit, vegetable, plain fat free milk and entrée [13,14]. Over a 15 month period, PFFM sales increased from a selection rate of 0.07 per student to 0.26, a 256% increase even when the prizes were as modest as low cost stickers or temporary tattoos. The small prizes were added to the emoticons to further increase healthful food selection. Chocolate milk showed a parallel decline in sales and overall, there was no change in total milk sales with 95% of students selecting milk throughout the intervention. Fruit and vegetable selection increased from 0.78 to 0.93 and from 1.08 to 1.21 per student respectively. The initial pilot, however, was only at a single school of about 300 students and thus was limited in scope. The objective of our current intervention was to expand our successful pilot to increase selection of fruits, vegetables and plain milk to 7 other elementary schools and describe longer-term results for the intervention. We now report on the results of our pragmatic PP intervention in 8 inner

city schools within the same school district over an academic year.

Methods: The intervention of emoticons and small prizes known as the Power Plate Program (PPP) was implemented at 8 inner city elementary schools in the Cincinnati Public Schools District (CPS) during the 2015-16 academic year (Figure 1). The schools selected were at the recommendation of the CPS Community Learning Center Coordinator. Our study staff met with the cafeteria staff and volunteers at each school to educate them on the PPP and observed the PPP at each school during the first week of the program. Volunteers participating in the PP varied from school to school, but typically were adult family members of students or members of community volunteer organizations. All volunteers were screened and certified by CPS. The demographics of the school are described in Table 1 [15]. Students in 7 of the schools included grades k through 6th grade (ages 5 to 12). One school has grades k through 8th grade, but 7th and 8th graders were not included in the study. Greater than 95% of students in all of these schools were below 130% of the U.S. poverty level and were eligible for free lunch because of the CPS district's overall demographics. The lunch is self-selected by participating students. Students are required to take 3 to 5 items, which may include an entrée with whole grain, low-fat plain or low-fat chocolate milk, and up to two fruit or vegetable servings.

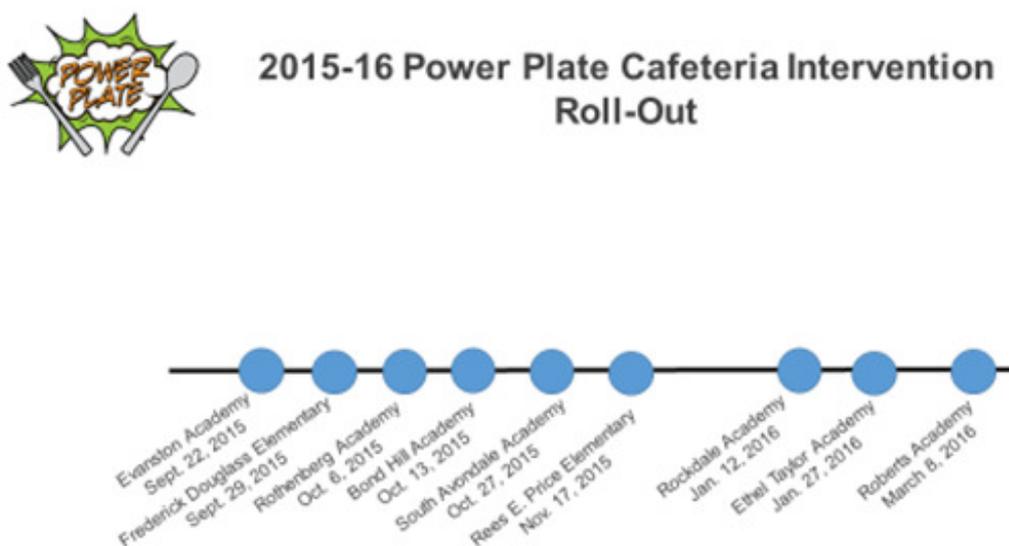


Figure 1: Roll Out of PPP at Individual Schools during the 2015-16 Academic Year

School	Enrollment	%Black	%White	%Hispanic	%Other*	%Girls	%Boys	% Low income #
Bond	252	94.4	2.4	1.6	0.8	47	53	96
Hill								
Ethel	297	94.9	2.7	0	2.4	50	50	98.3
Taylor								
Evanston Academy	327	93.6	1.8	1.8	2.8	44	56	97.9
Frederick Douglass	275	95.3	1.5	0.4	2.8	47	53	98.2
Rees E. Price	530	65.8	20	3.6	10.6	51	49	97.9
Roberts Academy	627	45.1	6.5	42.1	6.4	53	47	97.1
Rockdale Academy	297	90.2	2.4	0.7	6.7	51	49	98
Rothenberg Academy	396	94.2	1.3	0	4.5	48	52	98.5
All Schools Combined	3001	78.2	6	9.8	6	49	51	97.7

*Asian, Native American, Pacific Islander, 2 or more races #less than 130% of poverty level

Table 1: Demographics of schools participating in intervention

Green “smiley-faced” emoticons were placed by preferred food items (fruits, vegetables, plain fat free milk and entrée with whole grain) and signs were posted explaining the PP on the first day of the intervention (Figure 2). Small prizes were given students selecting the PP on Tuesdays and Thursdays once the intervention began. On the first day of the intervention, a small prize, such as a bracelet, was distributed to students who selected the PP (Figure 3). On all other PP prize days, either temporary tattoos or stickers were given to students who selected the PP by school volunteers.



Figure 3: Small prize given on first day of intervention with an example of a Power Plate meal



Figure 2: “Green Smiley Face” emoticon sign

Data and Statistics: Cafeteria cash register receipt data was collected for one month prior to the PPP intervention and then throughout the entire intervention which completed at the end of May 2016. Purchase data obtained from cash register receipts were supplied by the Food Services Department of Cincinnati Public Schools. Statistical analysis through Z-testing was used to compare the differences in the rate of food item selection between periods where there was no intervention (baseline) and when emoticons plus PP prizes were used. Z-testing was used to determine differences in the means as the sample size was large and there was no controlling for variables.

This project was reviewed by the Cincinnati Children’s Institutional Review Board, determined not to be a Human Subjects Research project and thus exempt.

Results: In all, data was obtained over 36 weeks on 330,580 student lunches, 27,371 before the PPP and 303,209 during the PPP. The results of the student’s food selection rate are summarized in Table 2. Overall, there were favorable and significant changes in the purchase of Plain Milk (an increase of 56%),

Chocolate Milk (a decrease of 17%), vegetables (an increase of 9.2%) and entrées (an increase of 2%). There were unfavorable, but small changes in Fruits (decrease of 2.9 %) and total milk purchase (a decrease of 3.6%). All changes received high levels of significance and may be explained in part by the large number of observations in the study. Fruit selection still remained high at one per student and may reflect as students increase vegetable selection, fruit selection may be slightly compromised.

Food Item	Rate selected per student pre-incentives N= 27,371 lunches	95% Confidence Interval	Rate selected per student with incentives N=303,209 lunches	95% Confidence Interval	P value comparing pre to with incentives
Plain milk**	0.147	0.142-0.151	0.23	0.228-0.231	<0.0000001*
Chocolate milk**	0.728	0.717-0.738	0.605	0.602-0.608	<0.0000001*
Combined milk	0.874	0.863-0.885	0.838	0.835-0.842	<0.0000001*
Vegetables**	1.299	1.274-1.323	1.416	1.409-1.422	<0.0000001*
Fruits	1.021	1.009-1.034	0.993	0.989-0.996	0.000008053*
Entrée**	0.941	0.930-0.953	0.959	0.955-0.962	0.006123*

**Experienced desirable change during intervention

Table 2: Summary of Food Items selected by CPS elementary students comparing pre-incentive rate and after initiating incentives. Z-test performed. Observation interval is 35 weeks, 4 weeks baseline, 31 weeks intervention

Figures 4-8 graphically demonstrates how the purchase of the food items, PFFM, chocolate milk, total milk, vegetables and fruits changed with time at the Cincinnati Public Schools. The beginning of our intervention is annotated with “PPP starts.” Each point represents the combined data of all schools during that particular week. The red line graphically

displays the mean fraction per student selected in the pre-intervention and intervention periods of the study. Of note, vegetables increased and remained consistently above baseline through the intervention while PFFM showed signs of a decline in purchase at the end of the intervention.

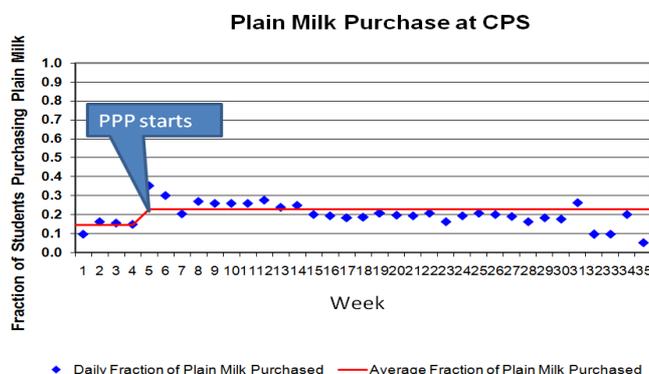


Figure 4: Fraction of CPS students purchasing PFFM over time

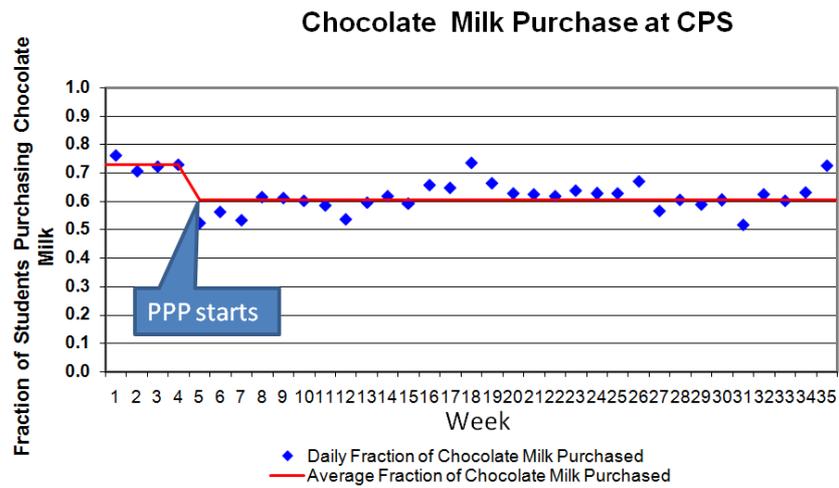


Figure 5: Fraction of CPS students purchasing Chocolate Milk over time

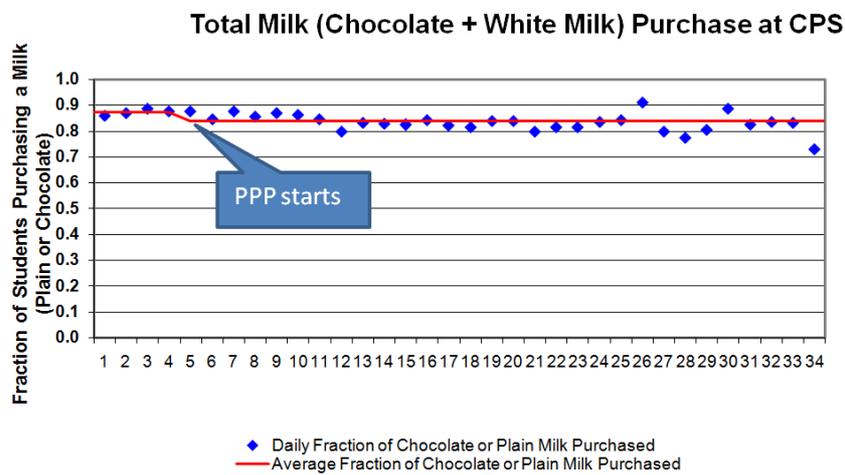


Figure 6: Fraction of CPS students purchasing milk, plain or chocolate (Total Milk purchased) over time

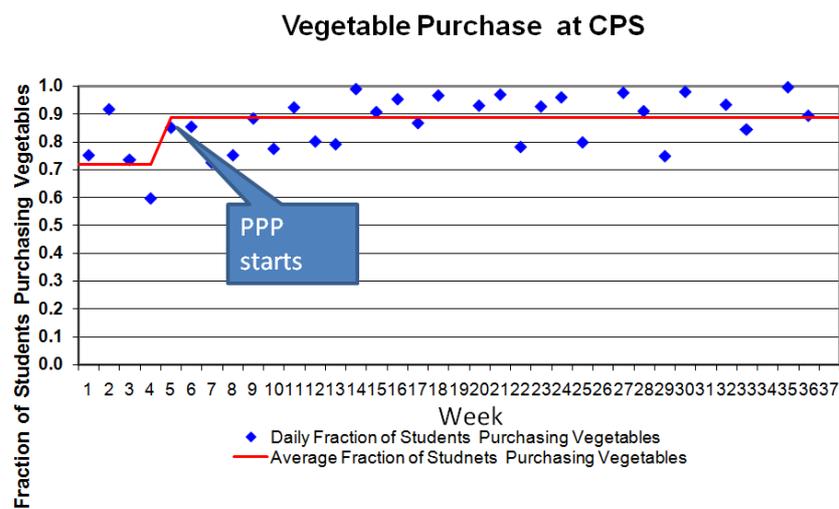


Figure 7: Fraction of CPS students purchasing vegetables over time

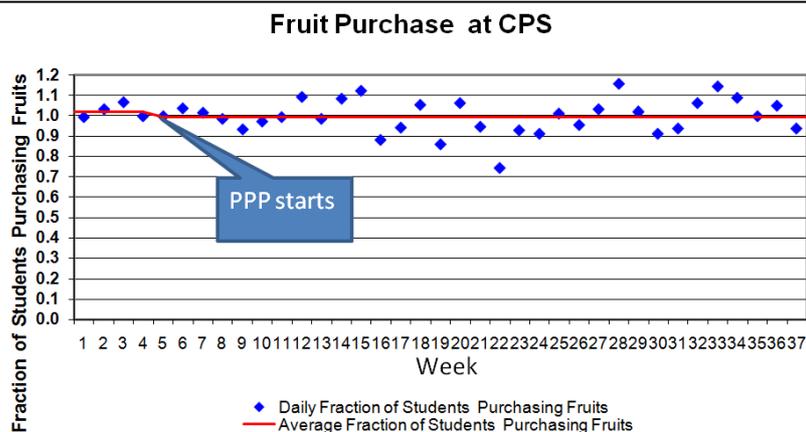


Figure 8: Fraction of CPS students purchasing fruits over time

Discussion: With our study, we demonstrate that the intervention of emoticons and small prizes as a reward increased vegetable and PFFM purchase and decreased chocolate milk purchase with inner city elementary school children. Of note, however, was that there may be a tapering of this effect with time. We also now note that there may be a very small but undesirable effect with decreased total milk and fruit purchase.

Our results in this study, while overall favorable, are more modest than in our pilot where we reported a 256% increase in PFFM, but similar in effect as other cafeteria interventions [13-18]. Wansink et al., for example, showed an increase of 102%, 35% and 16% respectively with interventions of repositioning fruit to new bowls, healthy food convenience checkout lines and giving attractive names to vegetables [15-18].

The more modest effect of the PPP compared to the pilot may relate to issues faced when increasing the scope or "spread" of this type of intervention. Cohen and Ball outline challenges to spread in a school setting which include availability and buy in of the staff, recruitment, training, logistics and organization [19,20]. These were all challenges faced by the schools that implemented the PPP. With our pilot, more training and observation of the PPP was possible by our study team. Recruitment of school volunteers to run the program for 3 hours each PP day seemed to be the greatest challenge. Interventions, however, in the school setting are critical and may be especially important for high-risk pediatric populations, particularly for children from low-income backgrounds.

As with our pilot, there are several limitations of our study. Since we had to rely on cash receipts to evaluate our intervention, we do not know the rate of PP selection, only the individual items. Unfortunately we did not have the manpower with this pragmatic intervention to collect data on actual PP selected and thus cannot describe changes in actual PP selection during baseline and the intervention. Also, as displayed in the graphs (Figures 4-8) there is great variation of week to week purchase data and thus our results should be interpreted with some caution. There are many variables in a school cafeteria which include particular items sold on a specific day, special occasions such as class trips or birthday celebrations, and weather disruptions; all of which may affect food preference and receipt data. Further, there are concerns that giving rewards for food selection may lead to avoiding a particular food when the rewards are stopped as described by Birch et al. in preschool children [21,22]. Long-term data including follow up of children exposed to the PP after the program has ended would be helpful in determining if this effect is seen with our intervention. Additionally, reliance on cash register receipt data does not permit exploring the impact of covariates such as gender and age on food purchasing. Finally, we only have purchase data for the intervention and do not know if waste was increased or decreased by the program. It is possible that food purchased was not consumed and that children may have purchased them in order to receive prizes. Still, our study gives a view of a very large number of student lunch purchases over an academic year.

In our study, we demonstrate that when children are given small incentives twice weekly they will select healthier food items while preserving personal choice.

More information is needed on whether this type of program will be successful over longer periods of time, whether consumption is affected and if the PPP will be successful in other types of communities that are more reflective typical school settings. One consideration for future research is to examine whether switching from a fixed to variable schedule of reinforcement might promote maintenance of intervention effects. Still, based our results we believe that emoticons with small prizes as incentives for better food choice leads to significant improvement in vegetable and plain milk purchase. Long-term studies of the PPP over the several years will be important to see if the effects of the intervention are sustained.

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