

**INTERNATIONAL JOURNAL OF FOOD AND
NUTRITIONAL SCIENCES**

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Official Journal of IIFANS

Research Paper**Open Access**

A TWO-TIERED SCHOOL CAFETERIA INTERVENTION OF EMOTICONS AND SMALL PRIZES INCREASED HEALTHFUL FOOD SELECTION BY OVER 300%Robert M Siegel^{1*}, Michelle Hudgens¹, Amy Annekin M S², Kenya Simmons²,
Jessica Shelly³, Ife Bell³ and Uma R Kotagal²

*Corresponding Author: Robert M Siegel, ✉ Bob.siegel@cchmc.org

Received on: 20th April, 2016Accepted on: 9th June, 2016

Poor food selection in school cafeterias is a risk factor for childhood obesity. The purpose of this study was to describe changes in purchasing with the two-tiered intervention of emoticons and small prizes in an elementary school cafeteria setting. Emoticons and small prizes as a reward were introduced sequentially over a three month period to encourage purchase of the Power Plate (PP) which consisted of the 4 most healthful foods: fruits, vegetables, plain fat free milk (PFFM) and entrée with whole grains. Purchase of PFFM increased from 7% to 48%, a 549% increase. Chocolate milk selection decreased from 87% to 45%. Selection of fruits increased from 1.0 to 1.2 and vegetables from 0.7 to 1.2 per student per day. There was no significant change in entrée selection or total milk purchase. An approach of emoticons followed by small prizes as an incentive for healthful food selections is effective in increasing PFFM, fruit and vegetable selection.

Keywords: Childhood obesity, Emoticons, Prizes, School, Cafeteria

INTRODUCTION

Childhood obesity is a major pediatric health issue with over one third of American children overweight or obese (Ogden *et al.*, 2014). Risk factors for childhood obesity include inadequate fruit, vegetable and milk consumption and excess consumption of sugary drinks; this has led to the American Academy of Pediatrics recommending lifestyle changes to correct these factors (Spear *et al.*, 2007). Poor choices in the school cafeteria are a risk factor for obesity as well (Finkelstein *et al.*, 2008). While there is variability in quality of what children choose with the school lunch program, packed lunches at home are significantly poorer in nutritional quality and thus efforts to increase school lunch program participation improve the quality of students'

diets (Farris *et al.*, 2014). Additionally, the school setting is an attractive place to intervene with obesity prevention programs as a larger number of children can be reached in a relatively uniform and consistent manner (Katz *et al.*, 2008). With this study, we describe the effects of a two-tiered intervention of emoticon placement and small prizes as an incentive for healthful food choices by elementary students.

Multiple interventions have been used in school cafeterias such as preferred food positioning, reduced pricing and in classroom educational programs to improve food selection (French and Stables, 2003). While fruit and vegetable selection may increase in the range of 20 to 400%, the programs are often limited, because of manpower and cost. Emoticons have been used in school aged children to

¹ Center for Better Health and Nutrition, The Heart Institute, Cincinnati Children's Hospital Medical Center, 3333 Burnet Avenue, Cincinnati, Ohio 45229.

² James M. Anderson Center for Health Systems Excellence, Cincinnati Children's Hospital Medical Center, 3333 Burnet Avenue, Cincinnati, Ohio 45229.

³ Cincinnati Public Schools, 2651 Burnet Avenue, Cincinnati, Ohio 452219.

influence choice (Privitera, Gregory *et al.*, 2014). We recently reported that using “Smiley-face” emoticons in an elementary school cafeteria increased vegetable and Plain Fat Free Milk purchase (PFFM) by 29% and 141% respectively (Siegel *et al.*, 2015).

The McDonalds Corporation pioneered giving small prizes as an incentive for food purchase in 1978 (Brownell and Horgen, 2004). The “Happy Meal” concept was remarkably successful and is currently used by much of the fast food industry (Kraak and Pelletier, 1998). Small prizes have also been used to promote healthy eating in children by offering an incentive for eating fruits or vegetables (Lowel *et al.*, 2004; and List and Samek, 2015). Hobin *et al.* (2012) used small prizes to encourage 6 to 12 year old campers to select a pre-packaged healthful meal over the traditional “Happy Meal.” In their study, they were able to increase the camper selection of the more healthful meal option by 100%. While both emoticon placement and small prizes are low cost and easy to implement, the additive effects of these interventions have not been described. We now report the results of the second intervention of small prizes as a reward for food selection on the previously described cohort of elementary school children.

MATERIAL AND METHODS

A two tiered intervention was done at the Frederick Douglass Elementary School (FD) of the Cincinnati Public Schools during the 2013-14 academic year. FD is an inner city school with grades k through 6 and, at the time of the intervention, had an enrollment of 297 children of whom 50.5% were female, 92.7% African American and 98.1% free lunch eligible (Startclass, 2016). The school participates in the USDA National School Lunch Program for free or reduced lunches. The students self-select at lunch and, under the program, may take 3 to 5 items, which may include an entrée with whole grain, low-fat plain or chocolate milk, and up to two fruit or vegetable servings. Competitive foods such as whole grain cookies and reduced fat chips are sold as well.

The emoticon intervention as previously reported began in October 2013 with the placement of “Green Smiley Face” emoticons by the preferred foods of entrée with whole grain, fruit, vegetable, and PFFM. In December, 2013 a second intervention, the “Power Plate” (PP) was introduced. With the PP, the emoticon signs were left next to the preferred foods. In addition, students were instructed that if they purchased a fruit, vegetable, PFFM and entrée with whole grain, they would receive a small prize. The quality of the

prize was varied as well the frequency to test the effects of level of reward on PP selection. Higher quality prizes were given to those selecting the PP daily for two weeks and then given twice a week for one week. The higher quality prizes were all forty cents or less and included miniature Frisbees, small beach balls and bracelets. Tattoos or stickers, which are lower quality prizes, were then given daily to those selecting PPs for one week and then twice a week for one. The intervention was then stopped and data were collected for an additional week to see if the effect would be sustained when the prizes were stopped.

To follow individual food item purchases, cafeteria cash register receipt data was collected for one month prior to the Emoticon intervention and then throughout the entire intervention. PP selection data were obtained by direct observation for three days before implementation and then throughout the duration of the study. Purchase data obtained from cash register receipts were supplied by the Food Services Department of Cincinnati Public Schools. Statistical Process Control (SPC) graphical methods were used to analyze changes in the purchase of individual food items and PPs. SPC methods were originally developed for analyzing industrial quality improvement initiatives and are now typically used in medical/health settings when control groups are not readily available (Benneyan *et al.*, 2003). Run charts were constructed for individual food items and PP purchases. Eight consecutive data points above or below an established mean, indicated statistical significance. Additionally differences were analyzed by Chi Square using SAS (version 9.3, SAS Institute, Cary, NC) when children were limited to the purchase of one item (entrée, PFFM, chocolate milk). This project was reviewed by the Cincinnati Children’s Institutional Review Board and determined not to be a Human Subjects Research project and thus exempt.

RESULTS

Overall, the study period was from 10/1/13 through 4/30/14. The number of students purchasing lunch ranged from 186 to 278 per day. Figures 1 through 4 show the purchase of the individual components of those that increased from baseline period during the interventions, PFFM, vegetables and fruits. The fourth component of the PP, the entrée, was selected at the same rate of 97% before and during the interventions. PFFM selection (Figure 1) was quite low before the interventions at 7%, increased to 15% when emoticons were placed and then averaged 48% during the PP intervention. This represents a 549% increase from

baseline ($p < 0.001$ by chi square). Chocolate milk selection (Figure 2) decreased from 87% to 45% ($p < 0.001$), while total milk sales remained constant at 95%. Vegetables (Figure 3) showed an increase from 0.7 per student to 1.2 per student (an increase of 71%), significant by SPC analysis with greater than eight measurement points above baseline. Fruits (Figure 4) had a more modest but still significant increase of 1.0 per student to 1.2 per student (an increase of 20%), also significant by SPC.

The overall effect of the second intervention, the PP, is shown in Figure 5. In all, 7271 meals were analyzed for PP components on 39 days. The “special case” days of juice being served as a fruit (we did not consider juice to be a fruit in the PP definition) and the day only one fruit was available are annotated in the figure as these events could explain variation out of the control limits which define 3 standard deviations from the mean. Before prizes were given for selecting the PP, only 10% of students selected the four PP components. Throughout the PP study period, including the week when no prizes were given, 42% of students selected the 4 components ($p < 0.0001$ by chi square), for an increase of 335% comparing before and after this part of the intervention.

Several factors that could influence PP selection were analyzed: upper (grades 4 to 6) versus lower grade (K to 3rd

grade), prize frequency and prize quality. Overall, 38% of children in grades 4 to 6 selected the PP compared to 45% in grades K to 3 ($p < 0.001$). In the K-3 group, 66% selected PPs with the higher quality prizes compared to 41% when stickers or tattoos were offered ($p < 0.0001$). Of note, lower frequency led to higher PP selection in those K-3, 53% compared to 41% when prizes were given every day ($p < 0.0001$). For the older group, grades 4-6, prize frequency had no effect on PP selection (41% for twice weekly compared to 43% for daily), but high quality prizes led to greater PP selection than low quality (48% versus 39%, $p < 0.0001$).

DISCUSSION

With our study, we demonstrate that emoticons labelling preferred food items along with small prizes can effectively improve food selection in children in an inner city elementary school setting. We saw significant improvement in three of the four preferred meal components with milk increasing by over 500%, fruits and vegetables by over 20% and the preferred combination of the PP by over 300%. These increases compare very favorably to previous efforts to improve elementary school student food selection which include giving nicknames to vegetables, preferred positioning of healthier items, highlighting, and convenience lines, which increase healthful selection in the range 30 to

Figure 1: Percent of Students Purchasing Plain White Milk Purchase versus Date at the Frederick Douglass School, Dates of Emoticon Placement and Power Plate Introduction are Annotated, N = Number of Students Who Purchasing Meals on a Particular Day, The Control Limits Define 3 Standard Deviations from the Mean (Centerline)

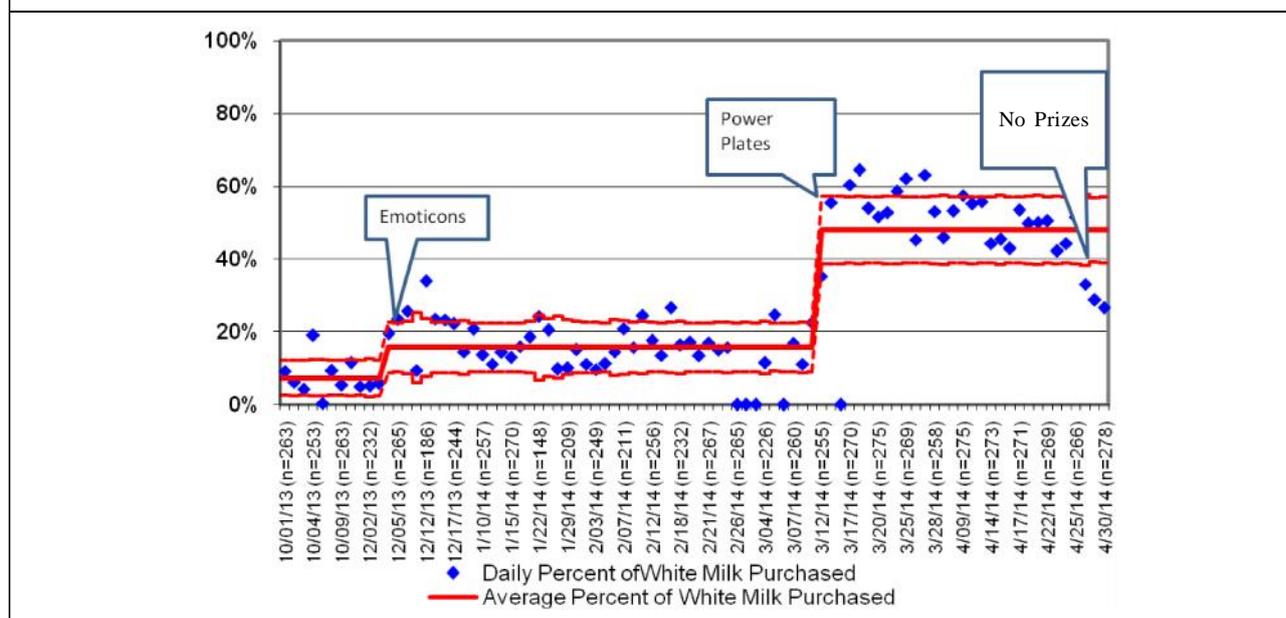


Figure 2: Percent of Students Purchasing Chocolate Milk Purchase versus Date at the Frederick Douglass School, Dates of Emoticon Placement and Power Plate Introduction are Annotated, N = Number of Students Who Purchasing Meals on a Particular Day, The Control Limits Define 3 Standard Deviations from the Mean (Centerline)

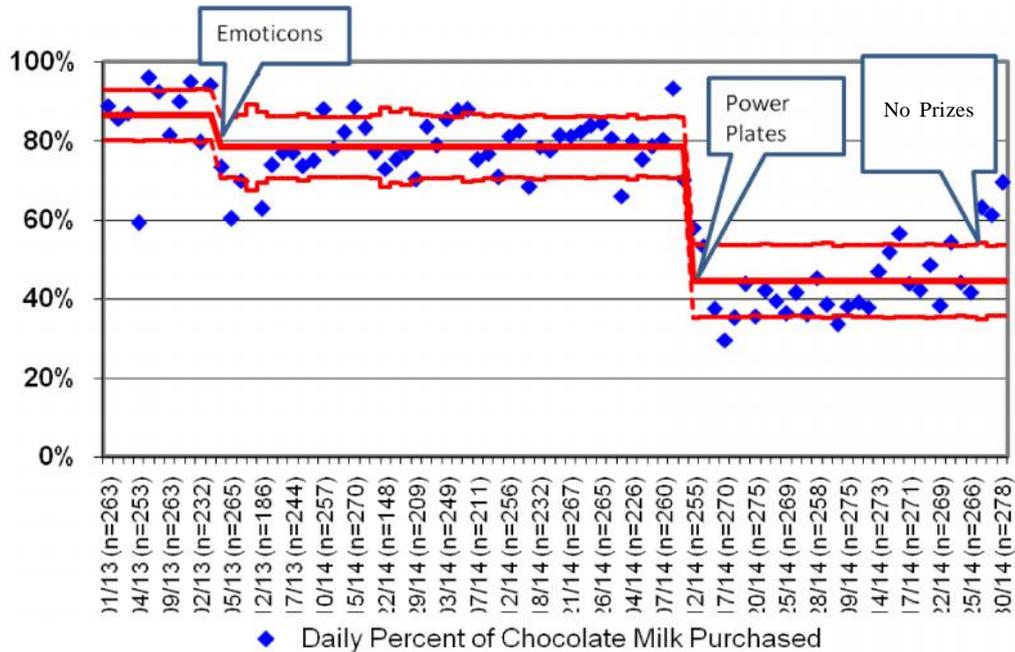


Figure 3: Vegetables Purchased per Student versus Date, N = Number of Students Purchasing Meals on a Particular Day, Dates Emoticons were Placed and Power Plate Implemented are Annotated

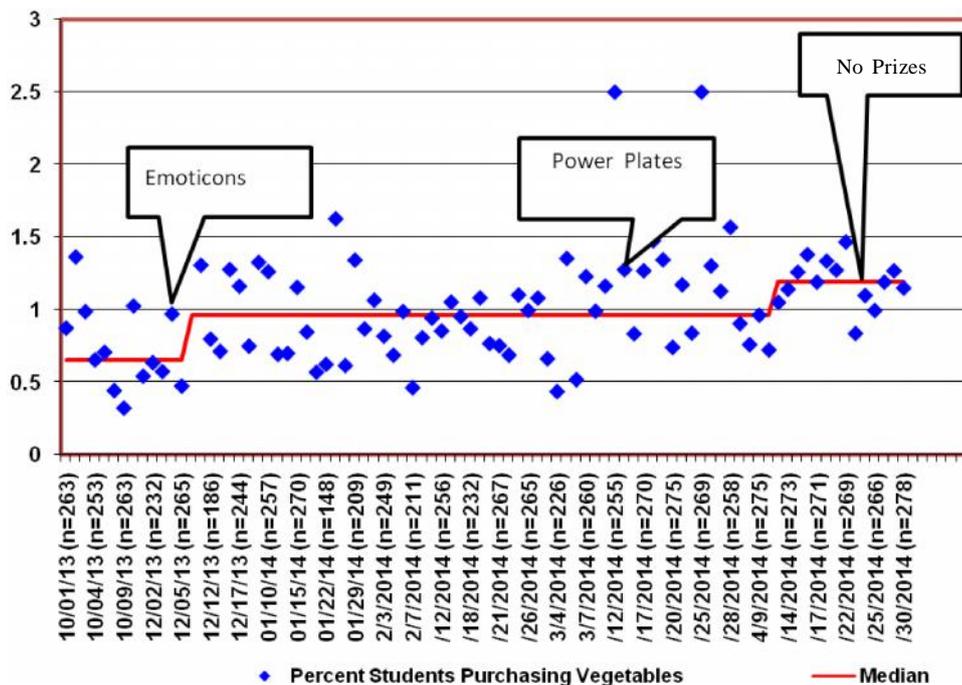


Figure 4: Fruits Purchased per Student versus Date, N = Number of Students Purchasing Meals on a Particular Day, Dates Emoticons were Placed and Power Plate Implemented are Annotated

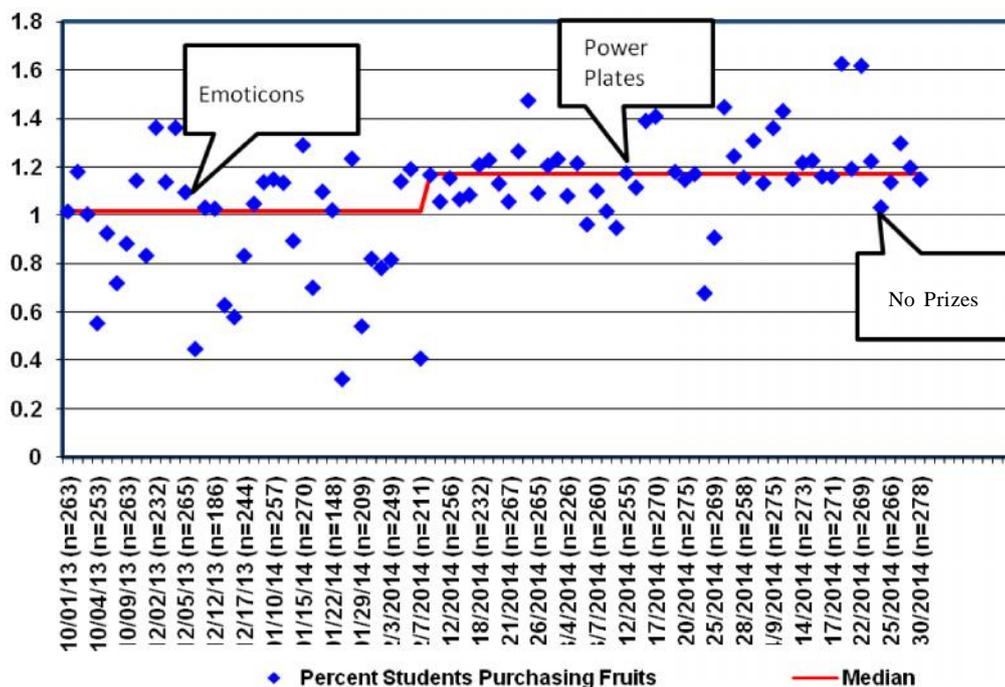
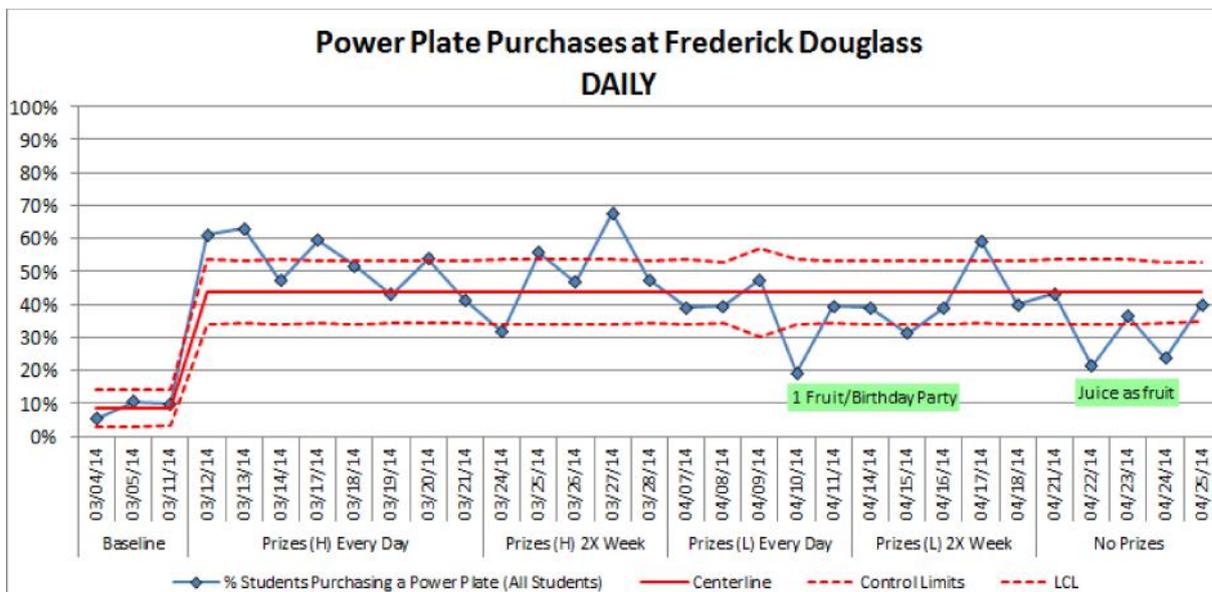


Figure 5: Percent of Students Purchasing Power Plates versus Date, Special Cause Days are Annotated, The Control Limits Define 3 Standard Deviations from the Mean (Centerline), Time Line shows Baseline (No Prizes), High Quality Prizes Daily, High Quality Prizes 2 Times per Week, Lower Quality Prizes Daily, Lower Quality Prizes 2 Times per Week and No Prizes



100% (Blanchette and Brug, 2005; Just and Wansink, 2009; and Wansink *et al.*, 2012). Both emoticons and prizes and have been used independently in experimental settings in school aged children to increase healthful food selection. Just et al, used small rewards in a school cafeteria setting to promote fruit and vegetable selection and showed an increase of 82% (Just and Price, 2013). We demonstrate that these interventions can be combined and is practical in an inner city school setting.

In our study, we varied the intensity and frequency of prizes to determine how these factors influenced selection. We found that while the prizes led to a great impact on PP selection in the older children, the effect was even greater in the younger children. Also, higher quality prizes led to increased PP selection in both older and younger children. Interestingly, prize frequency had no effect in the older children and lower prize frequency even led to greater PP selection in the lower grade children. This seems to be consistent with classic psychology studies of intermittent reinforcement being superior to continuous in this age group (Lewis, 1960).

There are several limitations to our study. The study period was relatively short. The effects of the prizes may extinguish with time. PFFM clearly dropped off when prizes were discontinued and suggests the prizes need to be maintained for the effect to continue. While we do have a “before and after picture” of the interventions and results were significant by traditional statistics and by statistical process graphical analysis, we did not have a control group for direct comparison. Also, we do not have student consumption data and do not know if the students were selecting the foods just to get the prize and not eating the preferred items. It is worth noting that we do not have a true baseline for PP selection before both components of the interventions were implemented, but rather only after the emoticons were placed. Most likely, PP selection was even lower before the emoticons and the overall increase was even greater than the measured 300% increase. Finally, the school cafeteria environment reflects the age of the students and is somewhat chaotic. Student food choices may have been influence by factors such as class trips, birthday parties, particular items served on a given day and even school disciplinary actions and led to great variability in day to day food item selection. This may led to the large variability in purchase data seen in the individual food component graphs. Finally, when prizes were stopped, selection of healthful choices dropped suggesting that prizes may have

to be implemented for a longer time or even indefinitely. Other types of interventions such as classroom education may be needed to affect internal motivation.

Clearly, future studies are needed to show long term efficacy of this type of intervention and it should be studied in more varied settings, particularly in schools with lower rates of free or reduced lunch participation. Also studies including consumption would be helpful to ensure that students are not only selecting healthful foods, but eating them as well.

CONCLUSION

A two-tiered intervention of emoticons and small prizes show that such a program can lead to dramatic increases in healthful food selection and is effective and practical in an inner school cafeteria setting.

ETHICAL ISSUES/APPROVAL AND DISCLAIMER

All the authors participated in the design and/or implementation of this study and all participated in the writing of this manuscript. The authors have no financial relationships to disclose.

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