



Research Article

Hip Hop H.E.A.L.S. (Health Eating And Living in Schools): The Feasibility of an After-school Math-based Nutrition Curriculum to Improve Menu Board Calorie Literacy

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Abstract

Background: Better food choices within fast food restaurants can significantly impact childhood weight gain. The effectiveness of menu board calorie postings requires “menu board calorie literacy (MBCL),” an understanding of relevant abbreviations, serving sizes, calorie ranges, simple math, and recommended energy intake. We assessed the feasibility of a math-based nutrition intervention designed to improve MBCL. **Materials and Methods:** We pilot tested Hip Hop H.E.A.L.S. (HHH) with a class of 5th-graders. HHH incorporated child-centric Hip Hop media and math Common Core standards. Students completed a MBCL assessment at baseline, immediately post-intervention, and 10-weeks post-intervention. **Results and Discussion:** The average MBCL score increased from 51.6% at baseline to 82.9% at immediate post-test ($p < 0.01$), and 78.6% at 10-weeks post-intervention. Overall, the program demonstrated high acceptability and engagement with the students. **Conclusion:** HHH presents a viable option for teaching nutrition and MBCL to 5th grade students using a math-based approach in the after-school setting.

Keywords: Nutrition; Intervention; Childhood obesity; Menu Board Calorie Literacy; School-based

Background

Fast food consumption and obesity are greater among minority children living in urban environments compared to non-Hispanic whites [1-3]. Children in low-income communities tend to have poorer access to healthy, quality food, often limiting their choices to fast food and contributing to childhood obesity and cardiovascular disease [4-6]. Even small changes reflecting healthier options in fast food restaurants could have a significant impact on weight gain at the population level, supporting the need for nutrition education programs targeting fast food environments.

Menu calorie posting mandates

Trends in fast food consumption and obesity rates led to providing point-of-purchase nutrition information, backed by local and federal calorie labeling mandates to help inform dietary decision making. The Affordable Care Act (section 4205) requires chain food establishments with 20 or more locations to label calorie counts for all regular menu items on menus, menu boards, drive-through menus, and food display tags [7]. Unfortunately, studies evaluating the impact of calorie postings specifically on parental purchases for their children found no difference before and after legislation implementation, despite awareness of the calorie postings [8,9]. Further, children often chose their own meals at the point-of-purchase, and continue to choose the same items after legislation [9].

Menu board calorie literacy

Evaluating the effect of calorie posting mandates at the point-of-purchase without considering the consumers' comprehension of posted information may lead to inaccurate conclusions. We have termed the comprehension of menu board calorie postings menu board calorie literacy (MBCL). MBCL requires an understanding of relevant abbreviations, serving sizes, calorie ranges, simple math, and recommended daily caloric intake. Socioeconomic status of the community has also been shown to influence the use of caloric information, with the weakest effects observed in the poorest communities [10]. In addition, low literacy and numeracy hinder the effectiveness of menu board calorie postings [11,12], a more prevalent problem among low-income minority populations.

Need for tailored nutrition education

Novel interventions designed to promote the use of calorie postings at the point-of-purchase and increase MBCL, especially in poorer, more obesogenic communities, are needed. Such interventions need to motivate consumers to utilize calorie postings, as well as increase their self-efficacy for using caloric information in dietary decision making. Further, conventional health education interventions assume communication and influence flow from parent to child. However, U.S. children under 12 years of age spend an estimated \$25 billion annually on food purchases for

themselves and influence another \$200 billion of parental spending [13]. Literature on health-related child-mediated parental influence suggests that young children can affect parental health behavior or knowledge [14-17]. An intervention directed at children and parents, via child-parent communication, may help improve MBCL and food purchasing behaviors of the family unit.

Hip Hop H.E.A.L.S.

We developed a school-based intervention that targets MBCL as a means of improving the point-of-service food choices in elementary-aged children. Hip Hop H.E.A.L.S. (Health Eating And Living in Schools; HHH) is a novel behaviorally-focused multimedia program that uses age- and culturally-relevant Hip Hop media uniquely designed to educate children at increased risk for childhood obesity about MBCL. HHH was built on Entertainment Education, also known as “edutainment,” which encompass several behavioral theories. Edutainment is the process of designing and implementing a media message to educate and entertain, in order to increase knowledge and awareness, create favorable attitudes and motivate behavior changes [18].

Theoretical models of edutainment interventions incorporated into HHH to foster behavior change in children include the Extended Elaboration Likelihood Model [19,20], the Theory of Reasoned Action [21] and Self-Efficacy [22]. The Extended Elaboration Likelihood Model addresses key components of engagement, including experiential involvement [19,20]. The Theory of Reasoned Action addresses the decision-making process for the children, who are the primary targets of the intervention [21]. Social Cognitive Theory [23] posits that control over one’s outcomes produces a sense of mastery, or self-efficacy, for those behaviors. Increased self-efficacy leads to increased motivation to engage in the desired behavior – utilizing menu board calorie information for dietary decision support.

We pilot tested HHH with 5th-grade students to assess the feasibility of delivery in the after-school setting. We present the results from this study, which also assessed the pilot effects of the intervention.

Materials and Methods

An after-school 5th-grade class of 20 African-American 9-10 year old students (12 female, 8 male) participated in the HHH pilot intervention. Institution Review Board approval was obtained from the university as well as the New York City Department of Education. Written parental consent and student assent were collected prior to program commencement.

Intervention and development

HHH was designed to provide 4th and 5th-grade children with the skills, confidence, and motivation necessary to engage in healthier food selection behaviors by teaching them basic consumer literacy and dietary decision-making skills. Throughout the program, students are encouraged to

share the information they learn with their parents. HHH consists of 20 one-hour lessons that address four core nutrition content areas: (1) calories and daily intake, (2) nutrient density and making healthy food choices, (3) menu board calorie literacy, and (4) physical activity and energy balance. Each lesson begins with a math-based warm-up activity that reviews important math concepts to be used that day. Lessons incorporate a combination of (1) media-based lectures via PowerPoint, which include cartoons (Figure 2) and music, (2) independent and group activities, and (3) comic books (Figure 1); all of which are integrated with math Common Core Standards. This integrative approach to nutrition education supports core academic goals of public schools, while simultaneously helping schools address healthy eating goals and nutrition education standards. It does not sacrifice the key elements of an effective nutrition education program recommended by the Institute of Medicine and the CDC [24,25].

The 20 one-hour lessons were delivered over 12 weeks. The students’ teacher was trained to facilitate HHH by a nutritionist and social science researcher who assisted with curriculum development. The teacher was trained on the full curriculum at the beginning and received booster training before each session. The training focused on the nutrition related content, as the 5th grade teacher had a firm understanding of the math principles involved.

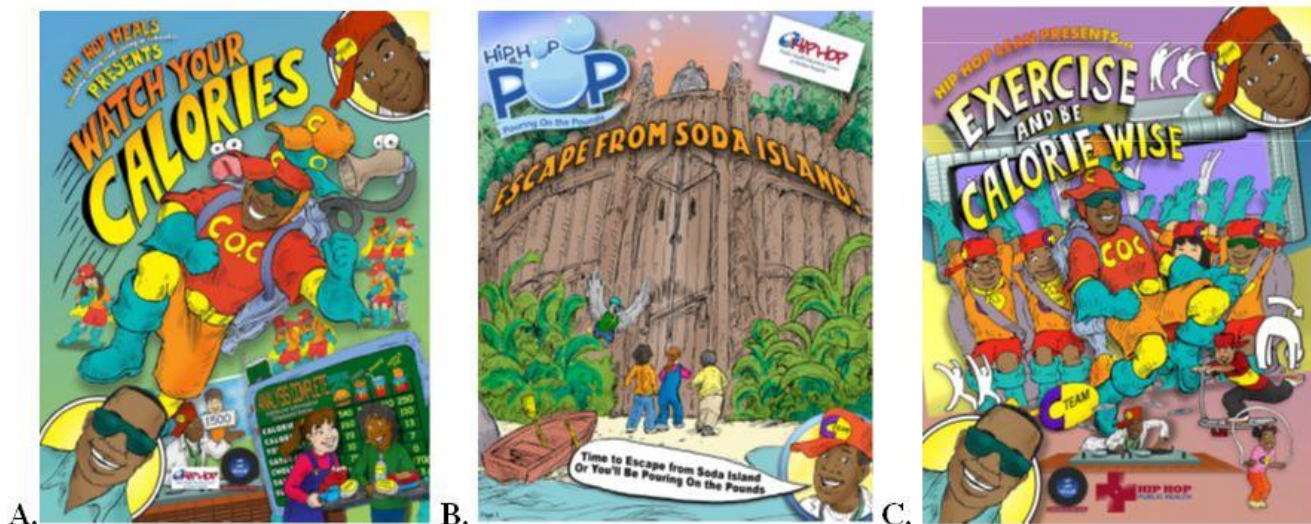
Data collection

Students completed a 9-item MBCL assessment at baseline, immediately following the intervention, and 10-weeks post-intervention. This assessment covered knowledge of calories, energy balance and MBCL. Eleven students completed a survey evaluation of the HHH program to assess their level of acceptance and enjoyment. We also conducted a focus group with these 11 students to further assess their overall experience with the HHH program, including what they enjoyed and the integration of math-based activities. The focus group was conducted by research staff and audio recorded. The HHH facilitator also provided qualitative feedback about the program at the end of implementation. Data were analyzed using descriptives and t-test means comparisons between pre and post-test and pre and delayed post-test using SPSSv23.

Results

Menu board calorie literacy

While 20 students participated in the HHH intervention, not all students completed each of the three MBCL assessments. Seventeen students completed the pre-test, 13 completed the immediate post-test, and 14 completed the delayed post-test. The average MBCL score at baseline was 51.6%, based on the number of correct responses. MBCL scores increased to an average of 82.9% at immediate post-test ($\Delta 31.3\%$, $p < 0.01$). A similar increase in knowledge was also found at 10-weeks post-intervention, with an average MBCL score of 78.6% ($\Delta 27.0\%$, $p < 0.01$).



A. Watch Your Calories, B. Escape from Soda Island, and C. Exercise and be Calorie Wise

Figure 1: Hip Hop HEALS comic books.



A. Watch your Calories, B. GO Slow Whoa, and C. Exercise and be Calorie Wise

Figure 2: Hip Hop HEALS cartoon music videos.

Program acceptability and impact

Overall the program demonstrated high acceptability and engagement with the participating students. All 11 students who completed the evaluation and focus group reported enjoying the program overall. Responses from two students regarding what they enjoyed about HHH included, “I enjoyed well everything. This program is the best program ever. I really liked Hip Hop L.E.A.N. [Learning Exercise and Nutrition; song/dance], That was cool!” and, “I enjoyed having fun learning new things about calorie ranges.” None found the math to be too difficult. Encouragingly, these students reported positive attitudes toward the incorporation of math into the program and even indicated that the math warm-ups helped them with their other class assignments. For example, “The warmups helped me with my homework sometimes.” A dominant strength of the program from students’ perspectives was its edutainment approach. For example, “I enjoyed when we got to do the [Hip Hop] L.E.A.N. dance and the rounding rap [activity],” and, “I enjoy learning about my calories and the song that we learned last week.” In addition, the students liked learning real-world

applications of nutrition and math concepts. For example, “The other thing I like is you helped me learn how to read the menu board because, before, I was reading the wrong thing.” More than half the evaluated students reportedly started using the information on the menu boards.

The HHH facilitator also reported acceptability of the program, both its content and its incorporation into the after-school setting. HHH provided students with reinforcing math practice as well as a new and engaging experience. Given that HHH was delivered after-school, the facilitator believed that the students benefited from the edutainment approach after spending the full day in school.

Limitations of reading comprehension

Both literacy and numeracy were barriers to overall comprehension and application of program concepts and activities. In particular, many students encountered reading comprehension challenges when solving the math words problems, often due to difficulties associated with the conceptualization of the nutrition components. As one student stated, “Sometimes wording was hard, sometimes the concept

was hard.” Students had difficulty translating some nutritional concepts into the correct mathematical operation(s) necessary to arrive at the correct answer. More specifically, students knew how to perform the correct math; however, they occasionally needed assistance identifying the appropriate operation(s) designated by the word problem.

Impact of hands-on activities

When teaching certain nutrition concepts, it was helpful to use a tangible, demonstrative activity to promote comprehension of the new and sometimes abstract information. For example, students experienced difficulty understanding what a serving size is and how to calculate the size of multiple servings. At the next lesson, students were provided pretzels to assist with the visualization of a serving size and provide a tangible approach to the math involved in determining the amount of food in multiple servings. The incorporation of such activities not only helped with comprehension, but also promoted student engagement.

Role of the child-centric media

The use of entertainment education was a dominant strength of HHH. Utilizing media such as songs, cartoons and comic books, as well as the rap and dance activities, promoted student engagement. In turn, these practices helped to abate cognitive fatigue experienced after the end of the school day by keeping the lessons dynamic. In addition, nutrition content was reinforced within the media, and this repetition can assist with comprehension.

Facilitator rapport and training

The choice of program facilitator is an important one. The facilitator in this study was a teacher well-known to the participating students, which highlighted the importance of rapport between the children and the educator. The teacher was well acquainted with and understood the students’ individual and group learning needs. For example, the facilitator knew the appropriate math terminology to use with these particular students when explaining how to solve a problem. In addition, the students trusted and respected their teacher. Students were more likely to press boundaries when an adult other than their teacher was in charge. While the use of a familiar educator and their rapport with the students was essential to the success of this pilot study, the importance of thorough training was also highlighted. In the event that the educator does not have a background in health education, sufficient training should be provided in order to avoid ambiguity of the nutrition education content and help field student questions.

Discussion

This pilot study supports the feasibility of implementing an integrated nutrition math curriculum in the after-school setting. We learned multiple important lessons related to the students’ comprehension of the material, their engagement with the program, and the importance of rapport between the

facilitator and students; all of which will improve the reproducibility of HHH. The results provide a greater understanding of the importance of numeracy and reading comprehension in relation to MBCL. Strengths of the program from student perspectives included its entertainment education framework and learning real-world applications of the math concepts they are learning in school.

Previous research indicates that 4th and 5th grade students are capable of transferring knowledge learned from health education programs to their parents [16]. As such, HHH was originally designed as a multigenerational program for 4th and 5th graders, in which the students are encouraged and prepared to share information about MBCL with their parents. Given that the pilot program was implemented in the first half of the school year, we engaged 5th graders, as 4th-grade students may yet to have covered some of the 4th-grade math Common Core Standards used to teach the MBCL concepts. Further, our intervention development work on HHH indicated that 4th graders may not yet possess the necessary math skills earlier on in the school year to comprehend and apply the skills taught in HHH.

This pilot study has several limitations. The MBCL measure used was only subjected to face validity and did not undergo full psychometric testing prior to use. However, this pilot did assist in the development of the final measure of MBCL [26]. Child mediation of the MBCL information with the students’ parents could not be confirmed. Another challenge was the program’s implementation in the after-school setting. Although this approach is pragmatic and bypasses in-school limitations, we found that some students do not attend every afternoon. As such, some children did not receive all 20-hours of education. To help overcome this anticipated limitation, we conducted brief reviews prior to each lesson.

Conclusion

HHH presents a viable option for teaching nutrition and MBCL to 5th grade students using a math-based approach in the after-school setting. Child mediation of the MBCL information will need to be validated in a subsequent study as well as assessing the impact on the parents’ MBCL in response to the intervention on their child. Overall, the participating students indicated acceptability of and engagement with the program. These findings will also require confirmation in a larger adequately powered study, in addition to the intervention’s effects on food choice behavior. From this pilot study, an expanded math-based nutrition curriculum is currently being implemented in an NIH-funded randomized controlled trial.

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