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# Parent Knowledge and Child Success in a Healthy Eating and Physical Activity Program

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**Objective:** The objective of this study was to determine the effectiveness of a 10-week multi-component healthy eating (HE) and physical activity (PA) intervention and draw conclusions about which program components promote weight-related success. **Methods:** Participants completed questionnaires pre/post program. Data collected include height/weight, demographics, knowledge, self-efficacy, social support, and behavior. We used t-tests, correlations, and logistic regression to examine relationships. **Results:** Overall, 28 children (mean age:  $10.9 \pm 1.7$ ; mean BMI:  $30.5 \pm 6.0$ ; 65.6% black) and 16 parents completed both questionnaires. Both children and parents significantly improved their HE and PA knowledge. Only 28% of the children lost any weight. Weight-related success was associated with an increase in parent HE knowledge and behavior. **Conclusions:** Child success is multi-faceted, and can depend on program attendance, body composition, and self-monitoring in addition to parent knowledge.

**Key words:** childhood obesity; multicomponent intervention; family; healthy eating; physical activity

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Even though trends show that prevalence is leveling off,<sup>1</sup> obesity continues to be a significant health problem in the United States.<sup>2</sup> Given the concurrent increase in Type 2 diabetes, cardiovascular risk factors and other obesity-related comorbidities in children and adolescents,<sup>3,4</sup> there is a critical need to develop and test interventions for children to prevent weight gain and promote weight loss. Interventions have demonstrated effectiveness when they focus on multiple determinants of obesity prevention and treatment, including nutrition, physical activity and behavior change strategies, social support, and self-monitoring;<sup>5,6</sup> in addition to parent and family involvement;<sup>7,8</sup> however, it is difficult to understand which components are most effective in eliciting behavior change.

Our aim in the present study was to determine the effectiveness of a multicomponent interven-

tion for overweight children ages 9 to 13 years and their parents in a community-based setting, and understand which program components promote weight-related success among children.

## METHODS

Let's Get Healthy (LGH) is a 10-week face-to-face healthy living and weight management program developed specifically for children age 9 to 13 years and their parents/guardians held at 4 locations in a large metropolitan area. All children were overweight or obese as assessed by their pediatrician, but that was not a requirement of LGH program enrollment. The program provides information to families on how to achieve a healthy and active lifestyle to prevent weight gain. The program's goal is to teach healthy lifestyles that will contribute to slowing the rate of weight gain, reduce the chance of long-term obesity,

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and promote a change in the culture of the home related to diet and exercise. Families are referred to the program through family physicians, pediatricians, pamphlets in physician offices, marketing, and word-of-mouth. Families participate as a team and learn together on their journey toward wellness. The program was created by physicians and experts in nutrition, behavioral health, and physical activity. Each LGH class provides content and hands-on activities in 3 main areas – nutrition, behavior modification, and physical activity. Program curriculum is delivered by experts in each of the main content areas, including registered dietitians, pediatricians, social workers, and exercise specialists.

### Procedures

Children and parents who participated in the LGH fall 2015 and winter 2016 sessions were asked by the research team to complete a paper-and-pencil questionnaire on week one and week 10 of the program. Participants were excluded from the analysis if they were absent during data collection, dropped out of the program before it was finished, lacked the cognitive ability to complete the questionnaire on their own, or did not provide consent or assent. A total of 32 parents and 66 children completed the pre-program questionnaire (T1); 20 parents and 36 children completed the post-program questionnaire (T2); and 16 parents and 28 children completed both pre- and post-program questionnaires, for a response rate of 40%.

### Study Measures

**Knowledge.** The research team created 12 healthy eating (HE; N = 9) and physical activity (PA; N = 3) knowledge questions for children and parents based on the LGH curriculum and they were assessed for content validity. The total number of correct answers was summed to create a physical activity PA knowledge score (range: 0-3) and a HE knowledge score (range 0-9), with higher scores indicating more correct answers. An example of a PA knowledge question was: “How many minutes per day of exercise should [kids your age/your child] get?” (30 minutes, 45 minutes, 60 minutes, 90 minutes). An example of a HE knowledge question was: “How many sugar-sweetened drinks a day should [you/your child] have?” (zero, one, two, three). HE and PA knowledge questions appeared on both the

parent and child questionnaires, with parent phrasing asking about their child’s HE and PA.

### Child Specific Measures

**Demographics and anthropometrics.** Children were asked to self-report their age. Race/ethnicity was provided by parents, and children’s height and weight were taken by program staff on the first and last week of the program. Weight was measured using a balance beam scale to the nearest 1/2 pound, and height was measured by using a wall-mounted measuring tape to the nearest 0.1 inch in a private setting. Body mass index (BMI) was calculated for each child. Height and weight was not recorded at one of the site locations, and therefore, weight results were only available for 29 child participants. Parent demographics and anthropometrics (height, weight, race/ethnicity, age) were not collected.

**Physical activity.** The Physical Activity Questionnaire for Older Children (PAQ-C) is designed to assess general physical activity levels among children in grades 4 to 8 (approximately 8-14 years).<sup>9</sup> Physical activity is described as sports, games, or dance that “make you breathe hard, make your legs feel tired, or make you sweat” and the questionnaire asks children if they have done pre-selected activities, such as tag, football, and soccer, in the previous 7 days. The scale measures overall physical activity (summary score), physical activity done during spare time, and physical activity done during recess, lunch, physical education (PE), after school, evenings, and weekends. Response categories (*no, 1-2, 3-4, 5-6, 7 or more times*) are coded on a 5-point scale with higher scores indicating higher levels of activity. There was acceptable test-retest reliability for males ( $r = 0.75$ ) and females ( $r = 0.82$ ),<sup>10</sup> and the PAQ-C has been correlated with accelerometry and other physical activity recall scales.<sup>11</sup>

**Physical activity self-efficacy.** The Physical Activity Self-Efficacy Scale (PASES) questionnaire measures children’s confidence to be physically active, and was adapted for use in this study to include 7 statements about children’s ability to overcome barriers to physical activity, including asking parents or friends to be physically active with them. Responses (0: *No*, 1: *Not Sure*, 2: *Yes*) were summed to provide a self-efficacy score (range 0-14) with high scores indicating higher self-efficacy for physical activity. The PASES questionnaire

has been validated in African American, Hispanic, and Caucasian child populations.<sup>12,13</sup> Test-retest reliability ranged from 0.61-0.82.<sup>12</sup>

**Healthy eating.** The HABITS questionnaire was adapted to assess the dietary intake of child participants. The dietary portion of the questionnaire contains 10 questions about children's eating habits during the past week. Responses indicate frequency of an eating behavior (0: *Never*, 1: *Several times a week*, 2: *Once a day*, and 3: *Twice or more a day*) with a total scale score range from 0.0-30.0. Junk food, juice and fast food items were reverse coded and summary scores were computed so that higher scores indicate healthier eating behaviors. This scale has produced valid and reliable psychometrics in this population, with a high test-retest reliability of  $r = 0.94$ , and a moderate internal consistency of  $r = 0.61$ .<sup>14</sup> The fruit and vegetable intake questions were summed to create a measure of fruit and vegetable consumption.

**Healthy eating self-efficacy.** Seven questions were developed based on previous self-efficacy surveys for children<sup>15</sup> and the goals for healthy eating reinforced in the program (ie, eating mindfully, making half of the plate fruits and vegetables). An example was: "I think I can drink water instead of sugar-sweetened beverages." Responses (0: *No*, 1: *Not Sure*, 2: *Yes*) were summed to provide a self-efficacy score (range 0-14) with high scores indicating higher self-efficacy for healthy eating.

**Child and Adolescent Social Support Scale for Healthy Behaviors (CASSS-HB).** CASSS-HB was used to examine children's perceived social support for behavior change. Specifically, 2 subscales examined parental support (12 questions) and support from friends (10 questions) for health, including healthy eating and physical activity. Responses (0: *Never*, to 6: *Always*) were summed to provide a self-efficacy score (range 0-60 and 0-72) with high scores indicating higher perceived support. CASSS-HB has showed evidence of validity and reliability in elementary-age child populations.<sup>16</sup>

## Parent Specific Measures

**Physical activity.** The International Physical Activity Questionnaire - Short Form (IPAQ-SF) is a self-report questionnaire to assess previous 7-day physical activity among adults that shows acceptable psychometric performance.<sup>17</sup> Vigor-

ous and moderate exercise were measured, as well as walking and sitting behaviors to create a total MET-minutes/week score for this study (see IPAQ Guidelines for Data Processing and Analysis, November 2005: <https://sites.google.com/site/theipaq/scoring-protocol>).

**Activity Support Scale for Multiple Groups (ACTS-MG).** ACTS-MG was used to measure parental support for children's physical activities.<sup>18</sup> Parents were asked to rate their level of agreement (1: *strongly disagree* to 4: *strongly agree*) with 12 statements related to promoting physical activity and discouraging inactivity for their child for an overall mean score, comprised of 4 subscales measure logistic support, modeling, use of community resources, and restricting access to sedentary activities. This scale has shown reliability and validity across different racial and ethnic groups.<sup>18</sup>

**Healthy eating.** Parents were asked to self-report their eating habits on a scale from 1: *poor* to 10: *excellent*.

**Social support for health eating.** Parental social support for healthy eating was measured using the emotional social support (ESS) and instrumental social support (ISS) subscales.<sup>19</sup> ESS includes such items as discussing eating habits with the child or complimenting the child, and ISS includes helping the child to set goals and giving the child fruits and vegetables to eat. Response categories ranged from 1: *not at all* to 5: *about every day*. Both ESS and ISS have shown good internal consistency and reliability.<sup>19</sup>

## Data Analysis

Statistical analysis was performed using IBM SPSS Statistics for Windows Version 24. Weight data was used to calculate 2 weight loss variables: (1) absolute weight loss (T2-T1), which was then further classified into "0" lost weight and "1" gained weight; and (2) a "successful maintainers" variable using the absolute weight loss variable. Children were considered successful maintainers if they gained 1.5 pounds or less over the course of the program, which, given daily weight fluctuations and type of clothing worn during the weigh-in, would indicate that they were close to maintaining their weight over the 10-week program.

Data were examined for outliers and normality, and no violations were found. Differential attrition was measured using independent samples t-tests

and chi-square analysis. Paired-samples *t*-tests were conducted to determine whether there was a statistically significant mean difference between baseline and post-program study variables among parents and children. Point biserial correlations were used to examine the relationship between changes in study variables and program success. A false discover rate (FDR) correction was used to account for multiple statistical testing.<sup>20,21</sup>

Finally, variables that were significantly associated with program success were entered into a binomial logistic regression to understand the unique contribution to child success in the program. Linearity of the continuous variables with respect to the logit of the dependent variable (program success) was assessed via the Box-Tidwell (1962) procedure.

## RESULTS

### Demographics

Of 75 parents and children who began the program, 28 parent and child pairs completed both pre- and post-program questionnaires across 4 program sites in a large urban and suburban metropolitan area. Children who completed the program and both pre- and post-program questionnaires ( $N = 32$ ) did not significantly differ by baseline physical activity, social support, eating habits, healthy eating and physical activity knowledge, weight, age, sex, race/ethnicity, or program site than children who completed the pre-program questionnaire only ( $N = 35$ ). Parents who completed both pre- and post-program questionnaires ( $N = 31$ ) did not significantly differ by level of physical activity, eating habits, knowledge or social support for healthy eating or physical activity than parents who completed the pre-program questionnaire only ( $N = 34$ ). Over half of the child participants were black, and children were on average  $10.9 \pm 1.7$  years of age with a body mass index (BMI) of  $30.5 \pm 6.0$ , as Table 1 shows.

### Knowledge, Self-efficacy, and Behavior

Both children and parents significantly improved their program-specific healthy eating and physical activity knowledge over the course of the program (Par-HE-K: ( $t(30) = -2.997$ ,  $p = .005$ ,  $d = .72$ ; Child-HE-K: ( $t(31) = -4.500$ ,  $p = .000$ ,  $d = .80$ ; Par-PA-K: ( $t(30) = -3.978$ ,  $p = .000$ ,  $d = .72$ ; Child-PA-

K: ( $t(31) = -2.647$ ,  $p = .013$ ,  $d = .47$ ), Tables 2 and 3 show. Effect sizes for the change were large. Child healthy eating and physical activity self-efficacy did not significantly increase over the course of the intervention, but parents reported providing more instrumental social support such as giving their child healthy eating information and feedback, and buying more fruits and vegetables by the end of the intervention (ISS:  $t(30) = -3.437$ ,  $p = .002$ ,  $d = .62$ ). Emotional social support provided by parents, such as encouraging and complimenting their child, did not significantly increase over the course of the intervention (ESS:  $t(30) = -1.311$ ,  $p = .200$ ,  $d = .23$ ). Children did not report a significant increase in perception of parent- or friend-specific social support for healthy behaviors, which included exercise and healthy eating (CASSS Parent and CASSS Friend), but parents did report providing more logistic support, such as taking their child to places where he/she can be active, and modeling, such as encouraging their child to be physically active by leading by example (ACTS:  $t(30) = -5.359$ ,  $p = .000$ ,  $d = .96$ ).

With respect to HE and PA behavior, children did not improve their overall eating behaviors ( $t(30) = -0.825$ ,  $p = .416$ ,  $d = .15$ ); however, they did significantly increase their fruit and vegetable consumption over the course of the intervention by about 0.5 ( $t(30) = -2.706$ ,  $p = .011$ ,  $d = .49$ ). Parents also reported an increase in healthy eating behaviors ( $t(30) = -4.728$ ,  $p = .000$ ,  $d = .85$ ). Child and parent self-report PA activities did significantly increase (Table 3).

### Weight and Weight Change

Regarding absolute weight change, only 8 of the 29 children (27.6%) with weight data at the end of the program lost any weight over the course of the program (range: -2.9 to -0.1 pounds). On average, children gained  $2.1 \pm 3.0$  pounds over the 10-week program ( $t(28) = -3.862$ ,  $p = .001$ ,  $d = .72$ ), and increased their BMI by  $.27 \pm .6$  units ( $t(28) = -2.335$ ,  $p = .027$ ,  $d = .43$ ), although the effect size was small to medium.

Children were considered “successful maintainers” if they gained 1.5 pounds or less over the course of the program, which, given daily weight fluctuations and type of clothing worn during the weigh-in, would indicate that they were close to maintaining their weight. Of the 29 children who

had weight data at T2, 12 (41.4%) were successful maintainers, meaning that if they gained weight, it was slight. Successful maintainers were not different than the weight gain group by baseline PA, HE, knowledge, self-efficacy, or social support; however, there were statistically significant strong correlations between program success and change in parent HE knowledge and change in parent HE behavior ( $r_{pb}(20) = .553, p = .009$  and  $r_{pb}(20) = .526, p = .014$ , respectively). Successful child program participants' parents reported a larger increase in HE knowledge ( $0.33 \pm 3.4$  versus  $0.24 \pm 4.1$ ) and HE behavior ( $1.82 \pm 1.3$  versus  $0.67 \pm 1.5$ ) over the course of the intervention compared to child participants who gained weight. This suggests that 28%-31% of the variance in child success in the program can be explained by parent HE knowledge and behavior change.

Data regarding change in parent HE knowledge and parent HE behavior were entered into a logistic regression predicting child success. Both continuous independent variables were found to be linearly related to the logit of the program success variable. The logistic regression model was statistically significant,  $\chi^2(2) = 11.637, p < .0005$ . The model explained 53.0% (Nagelkerke  $R^2$ ) of the

**Table 1**  
**Characteristics of Program Participants**

Children <sup>a</sup> (N = 32)	
<b>Sex, N (%)</b>	
Boys	15 (46.9)
Girls	17 (53.1)
<b>Race/Ethnicity, N (%)</b>	
Black	21 (65.6)
White	8 (25.0)
Other <sup>b</sup>	3 (9.4)
<b>Age in years, mean (SD)</b>	10.9 (1.7)
<b>Weight in lbs., mean (SD)</b>	157.9 (42.1)
<b>Height in inches, mean (SD)</b>	59.9 (4.2)
<b>Body Mass Index (BMI), mean (SD)</b>	30.5 (6.0)

**Note.**  
a: Parents did not provide demographic information  
b: Includes Arab-American, Asian, Hispanic/Latino, and multiracial

variance in program success and correctly classified 78.3% of cases. Sensitivity was 90.9%, specificity was 84.6%, positive predictive value was 61.5% and negative predictive value was 66.7%. Of the 2

**Table 2**  
**Descriptive Statistics and t-test Results for Healthy Eating Knowledge, Self-efficacy and Behavior among Program Participants**

Healthy Eating Outcomes	Pre-Program		Post-Program		N	95% CI for Mean Difference	Cohen's d	t	df	
	M	SD	M	SD						
<b>Knowledge (HE-K)</b>										
Child	5.47	2.48	7.22	2.00	32	-2.54, -0.96	0.80	-4.500**	31	
Parent	8.13	1.36	8.77	1.43	31	-1.08, -0.21	0.54	-2.997**	30	
<b>Self-Efficacy/Social Support</b>										
Child - HESE	11.07	2.26	11.61	2.67	28	-1.60, 0.53	0.20	-1.034	27	
Parent - ISS	3.78	0.87	4.33	0.59	31	-0.87, -0.22	0.62	-3.437**	30	
Parent - ESS	3.90	0.74	4.02	0.60	31	-0.31, 0.67	0.23	-1.311	44	
<b>Behavior</b>										
Child - HABITS	14.65	4.00	15.29	3.23	31	-2.24, 0.95	0.15	-0.825	30	
Child - FV only	2.41	1.06	2.90	1.30	31	-0.85, -0.12	0.49	-2.706**	30	
Parent	5.13	1.89	6.45	1.43	31	-1.89, -0.75	0.85	-4.728**	30	

\*  $p < .05$ ; \*\*  $p < .01$  (adjusted for FDR)

**Table 3**  
**Descriptive Statistics and t-test Results for Physical Activity Knowledge, Self-efficacy and Behavior among Program Participants**

Physical Activity Outcomes	Pre-program		Post-program		N	95% CI for Mean Difference	Cohen's d	t	df
	M	SD	M	SD					
<b>Knowledge (PA-K)</b>									
Child	1.31	1.00	1.84	0.95	32	-0.94, -0.12	0.47	-2.647*	31
Parent	1.90	0.75	2.45	0.77	31	-0.83, -0.27	0.72	-3.987**	26
<b>Self-Efficacy/Social Support</b>									
Child - PASE	10.03	2.80	10.29	3.14	31	-1.33, 0.81	0.09	-0.494	30
Child – CASSS Parent <sup>a</sup>	60.02	12.04	56.67	14.70	30	-1.99, 8.69	0.23	1.284	29
Child – CASSS Friend <sup>a</sup>	33.88	14.74	37.17	16.27	29	-9.65, 3.06	0.20	-1.062	29
Parent - ACTS	2.68	0.61	3.19	0.62	31	-0.71, -0.32	0.96	-5.359**	30
<b>Behavior</b>									
Child (PAQ-Total)	2.35	0.57	2.44	0.58	31	-0.30, -0.13	0.15	-0.820	30
Parent (total METs)	1191.29	1711.14	1637.76	2233.49	17	-1172.83, 279.89	0.32	-1.303	16

\* p < .05; \*\* p < .01 (adjusted for FDR)

Note.

a: Scale includes social support for healthy eating and physical activity

predictor variables only one was statistically significant, change in parent healthy eating knowledge (Table 4). An increased in parent HE knowledge resulted in 3.95 times higher odds of their child being a successful weight maintainer.

**DISCUSSION**

Both children and parents in the 10-week Let's Get Healthy (LGH) program significantly increased their healthy eating and physical activity knowledge. Parents perceived that they provided significantly more instrumental support for healthy eating and more overall support for physical activity, even though children did not perceive an

increase in support for healthy behaviors from parents. Whereas self-efficacy for healthy eating and physical activity did not increase, consumption of fruits and vegetables by children and parental self-report of healthy eating did increase. Overall, children in the program did not increase physical activity or lose weight; however, the single factor that was predictive of programmatic success was an increase in parental healthy eating knowledge over the course of the intervention.

It is not uncommon for brief community or clinic-based weight loss or weight gain prevention lifestyle interventions to see changes in knowledge or behavior, but not weight status or body com-

**Table 4**  
**Logistic Regression Predicting Likelihood of Program Success based on Change in Parent Healthy Eating and Behavior**

	B	SE	Wald	df	p	Odd Ratio	95% CI for Odds Ratio	
							Lower	Upper
<b>Change in Parent HE Knowledge</b>	1.373	.433	2.265	1	.132	1.919	.821	4.483
<b>Change in Parent HE Behavior</b>	.652	.660	4.330	1	.037	3.949	1.083	14.398
<b>Constant</b>	-1.842	1.038	3.152	1	.076	.158		

position.<sup>22</sup> In a randomized controlled trial examining a family-based intervention in primary care, researchers found that although parent-reported child healthy eating may have improved at both 9 and 15 months, there was not a subsequent sustained reduction in BMI over time.<sup>23</sup> A significant increase of 0.5 fruits and vegetables over 10 weeks, when maintained over time, can have clinically meaningful results. The LGH intervention effects (increased support by parents for child behavior change, increased intake of fruits and vegetables among children, and increased knowledge) may require longer term follow-up to understand the mechanisms by which changes in knowledge, support, self-efficacy, and behavior can lead to weight stabilization or weight loss among children.

Our findings suggest that parent knowledge might be a key target for child success in multi-component interventions. It is not surprising that as a child's primary caregiver, parents are in the best position to support their children's healthy eating and physical activity efforts. Previous studies have shown how parent dimensions, particularly acceptance,<sup>24</sup> meaningful involvement<sup>25</sup> and behavior,<sup>26</sup> can be impactful in family-based interventions. The information can help clinicians and interventionists make informed decisions on how best to utilize resources to support and engage parents.

There are several limitations to this study, including the self-report nature of the measures, and high levels of attrition leading to a smaller sample size that may compromise the ability to detect statistical significance over time. Weight and height data were not collected post-program at one intervention site. Furthermore, we did not ask for parent height and weight data, and because parent weight change is an excellent predictor of child success in family-based weight loss programs,<sup>27,28</sup> it would have been helpful to have collected this. A longer-term study with a comparison group is needed to understand the effects on children resulting from changes in self-reported behavior and knowledge among parents.

## IMPLICATIONS FOR HEALTH BEHAVIOR OR POLICY

Our findings can guide further research in the area of effective community-based intervention development for overweight and obese youth and

their families. Findings from this study show that small changes in parent knowledge about healthy eating and physical activity can have effects on child program success. Researchers may build on our findings and design studies to further understand the mechanisms by which parent knowledge influences family food purchasing decisions, the home environment and mealtimes, or interactions with their child and how these results are sustained over time. Practitioners (health behavior professionals, nutritionists, exercise specialists) can ensure that parents/guardians are learning alongside youth and engaged in the process of behavior change. Finally, given that family-based obesity prevention and treatment programs, including the one studied in this article have shown success, physicians can advocate for and promote the institutionalization of third-party payer mechanisms to support programming for families in need of such resources.

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## Human Subjects Approval Statement

This study (IRB #9828) was approved by the Henry Ford Health System Institutional Review Board (9HFHS IRB). We obtained informed consent from all parent participants and assent from all youth participants prior to beginning the data collection.

## Conflict of Interest Declaration

All authors of this article declare they have no conflicts of interest.

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