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Outcomes of a Weight Management Program Conjointly Addressing Parent and Child Health

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Childhood overweight and obesity is a national health concern, and 32% of youth in the United States are overweight or obese (Ogden, Carroll, Kit, & Flegal, 2014). Pediatric overweight has significant health consequences, including elevated lipids and blood pressure, insulin resistance, liver disease, and sleep disordered breathing (Daniels, 2006; Freedman, Mei, Srinivasan, Berenson, & Dietz, 2007; Weiss, Ratner Kaufman, 2008). Further, children with overweight are at increased risk for low self-esteem, decreased quality of life, peer victimization, and depressive symptoms (Daniels, 2006; Griffiths, Parsons, & Hill, 2010; Puhl, Luedicke, & Heure, 2011; Williams, Wake, Hesketh, Maher, & Waters, 2005).

Family-based behavioral interventions and lifestyle interventions are effective for treatment of pediatric overweight (e.g., Janicke et al., 2014; Oude Luttikhuis et al., 2010; Whitlock, O'Connor, Williams, Beil, & Lutz, 2010). Programs frequently include psychoeducation and goal setting on appropriate dietary intake (e.g., decreasing calorie consumption, balanced meals using the My Plate model) and physical activity behaviors (e.g., increasing physical activity, decreasing sedentary activities, minimizing screen time; Oude Luttikhuis et al., 2010). Many programs also include a component regarding behavioral and self-monitoring techniques to support changes in health behaviors (Oude Luttikhuis et al., 2010). These components are consistent with expert committee recommendations for structured weight management efforts and comprehensive multidisciplinary interventions (Barlow, 2007). Programs addressing the three components of dietary, physical activity, and behavioral strategies to support changes in health behaviors are effective for reducing child BMIz (Body Mass Index z score; Janicke et al., 2014) and are the most effective of all behavioral weight management programs (Whitlock et al., 2010). However, the size of the treatment

effect is moderated by a number of treatment factors, such as number of sessions, whether the program is individual or group format, or child age (Janicke et al., 2014). Behavioral programs of moderate to high intensity (greater than 10 hours of treatment) lead to greatest changes in health outcomes (Whitlock et al., 2010). Outcomes from family-based behavioral interventions have been found to be maintained for up to 10 years following treatment (Epstein, Valoski, Wing, & McCurley, 1994).

Pediatric weight management programs that involve parents while targeting child lifestyle changes in diet and physical activity may lead to greater reductions in child weight and better child outcomes than interventions without parental involvement (Gilles et al., 2008; Heinberg et al., 2010; Kamath et al., 2008), although this association has not been consistently supported (e.g., Janicke et al., 2014). Parent participation typically involves education on strategies to improve the lifestyle choices and health of their child with overweight or obesity rather than direct application of this information to their own health and diet. Parents serve a supportive role to promote gains in child health in these programs, but efforts to address parent health are not made. While significant research has supported behavioral interventions incorporating parent involvement to address pediatric overweight, fewer studies have evaluated treatment programs designed to concurrently target parent and child weight loss. However, targeting parent health change in weight management programs could provide parents the opportunity to learn about healthy lifestyles choices and make health behavior changes that can improve their own health. This is particularly important given that higher parental weight is associated with higher child weight (Epstein & Squires, 1988). Some research has suggested that weight management programs targeting both parent and child weight loss may result in reductions in parent weight and also teach parents how to model appropriate health behaviors for their children during treatment participation (Epstein, Wing, Koeske, Andrasik, & Ossip, 1981). However, additional research in this area is needed as these studies have generally been small.

The purpose of the current study was to conduct a randomized controlled trial of a family based weight management program focused on changes in *both* parent and child health. Prior research has supported the effectiveness of the child focused program for reducing child BMIz score and improving child weight-related health behaviors (Davis, 2011; Dreyer et al., 2009; Landrum, Davis, & Felts, 2008). However, this program solely focuses on changes in child weight-related health and behaviors, with no focus on parent change. While other randomized controlled community based pediatric obesity programs have been proposed (Poe'e, Heerman, Mistry, & Barkin, 2013) or have yielded positive preliminary results (Foster et al., 2012; Kalarchian et al., 2009), parental outcomes are not a primary target.

The primary hypothesis, based upon our randomized controlled crossover design, was that families who receive the intervention focused on both parent and child health changes would demonstrate significantly greater improvements in parent and child health behavior changes than families in the wait list control group. Effectiveness of this program for promoting parent and child weight loss and improving child weight-related behaviors is compared to a wait list control group. Further, the study examines the effectiveness of this program when implemented with a diverse and heterogeneous sample of patients seeking treatment for

pediatric obesity and overweight from programs and providers and in our area. Further unlike many other randomized control trials, patients were not paid for their participation. Therefore, it is intended that the findings of this study can be generalized to heterogeneous treatment seeking samples in clinical settings.

Methods

Participants

Participants were recruited and identified via free BMI screenings provided at local community events. Area physicians, clinics, social workers, and other healthcare professionals as well as families who completed the program also provided referrals. Inclusion criteria were child age between the ages of 2–18 years, child BMI percentile at or above the 85th for age/gender, and at least one parent or legal caregiver who would attend groups and complete measures. Participants were excluded if they or their parents did not speak English or Spanish. Children were also excluded from participation if symptoms of a comorbid diagnosis prevented them from being able to participate in the group treatment setting (e.g., severe autism spectrum disorder). However, children were not excluded simply for having a comorbid diagnosis (e.g., Attention Deficit Hyperactivity Disorder, Oppositional Defiant Disorder). The current analyses excluded the BMI data of parents who were pregnant during the course of data collection.

Ninety-six children and their parents were randomized to either the immediate treatment or waitlist control condition. Fifty-four children and their parents were assigned to the immediate treatment condition, and 42 were assigned to the waitlist control condition. Families in the waitlist control condition were invited to participate in a weekly exercise forum but did not receive the *Healthy Hawks Super* intervention. Children were from 3 through 18 years old ($M = 10.03$, $SD = 3.49$) with an average baseline BMIz score of 2.42 ($SD = .59$). Equal numbers of males and females participated. Participants were predominantly Latino (58.33%) and had Medicaid insurance (73.96%). Seventy mothers and ten fathers accompanied children to treatment sessions and provided data necessary for inclusion in the current analyses. Parents were from 25 to 53 years old ($M = 38.46$, $SD = 7.33$) with a mean baseline BMI of 33.53 ($SD = 6.95$). Families attended an average of 7.46 ($SD = 4.78$) of the 12 treatment sessions. See table 1 for complete demographics, including by condition (i.e., treatment or waitlist).

Measures

Demographics—Parents completed a questionnaire at time of enrollment to provide information on race, ethnicity, age, and gender.

Anthropometrics—Trained study staff collected parent and child height and weight while subjects were wearing light clothes (i.e., t-shirt and shorts) and no shoes at baseline and the final treatment session. Height was measured using a stadiometer (Holtain Ltd., Crymych, Dyfed, UK), and weight was measured on a digital scale (Temp-Stik Digitron 8000 National Medical Corp., Temp-Stikcorp). Child BMIz score accounting for both weight-for-height and gender were computed with the Center for Disease Control BMI calculator for the

Statistical Analysis Software program (available online at <http://www.cdc.gov/nccdphp/dnpao/growthcharts/resources/sas.html>). Parent BMI data were calculated using Centers for Disease Control and Prevention BMI calculator (available online at <http://www.cdc.gov/healthyweight/assessing/bmi/>).

Physical Activity—The ActiGraph (Actigraph LLC, Pensacola, FL) is an accelerometer and was used to measure children's physical activity at baseline and the final treatment session. The GT3X and GT1M models were used and programmed for a 60-second data collection interval. Accelerometer data were downloaded using MeterPlus (version 4.3, Santech, Inc., La Jolla, CA). At all assessment time points children were given activity monitors one week and they were collected the next; thus 7 days of wear time were possible. Three valid days with at least six hours of wear time per day were required for inclusion in the analyses (Masse et al., 2005; Trost, Loprinzi, Moore, & Pfeiffer, 2011). The three days with the highest activity (two weekdays and one weekend day) were used to calculate physical activity. Prior to analyses, the two weekdays and one weekend day with the greatest amount of valid wear time were selected for each participant and those 3 days were used in all analyses. Minutes of moderate, vigorous, and very vigorous activity (as defined by the MeterPlus software) were combined to create a single variable representing average number of minutes of moderate to vigorous activity per day, and minutes of sedentary activity remained as a separate variable. The minutes of activity variables were adjusted for the amount of wear time by dividing the total minutes of each variable (sedentary and moderate/vigorous/very vigorous hard activity) over the 3 days by the total minutes of wear time over the 3 days. The variables were then normalized to a 16 hour day of wear time for analysis. These methods have been shown to be valid previously (Trost, et al., 2011).

Dietary—Families recorded all food and beverage intake over a consecutive three-day period on a booklet form at both baseline and post-treatment phase. Staff provided training on keeping a diet diary and encouraged completing the record together with their child, especially for school lunches and meals eaten outside the home. Teenagers were encouraged to complete their record on their own. Dietary intake data were analyzed using Nutrition Data System for Research developed by the Nutrition Coordinating Center (NCC; 2010, University of Minnesota, MN). A registered dietitian performed quality assurance on all dietary intake data by utilizing NCC's Dietary and Supplemental Recall Checklist. Nutrition data used for analyses include average daily kilocalories, percentage of calories from fat, number of servings of fruits, number of servings of vegetables, number of servings of red foods (food with more than 7 grams of fat and/or 12 grams of sugar (L. Epstein & Squires, 1988) and number of servings of sugar sweetened beverages.

Procedures

All study materials were provided to families in their preferred language (i.e., Spanish or English). Families completed an initial enrollment packet by mail. Groups of completed packets were accumulated until there was a sufficient number to begin a cohort, typically 16–20 families. Families were stratified into approximately equivalent matched pairs on the variables of child BMIz score, parental BMI and family composition (one parent home, two parent home). Then, using a random numbers table, one half of the pair was assigned to the

treatment group and one half to the wait list control group. If siblings were participating together, they were always assigned to the same condition based upon the oldest sibling. Though allowing siblings to participate did mean that each patient was not necessarily an independent observation, it was important that all children within a family have access to the same clinical services, as would be expected in a community-based clinical setting. Additionally, this allows the sample to be more representative of treatment seeking patients, who often seek treatment at the same time as other family members. Each cohort had approximately eight English speaking families and eight Spanish speaking families in active treatment, and an equal number assigned to the wait list control group. After completion of the wait-list control condition, families were invited to cross over and take part in the next cohort of the active intervention. Cohorts started approximately every 3 months. All participants under age 18 provided written assent and at least one parent or legal guardian provided signed consent. The Human Subjects Committee at the XXXXX approved the procedures and protocol for this study.

Healthy Hawks Super Intervention

The treatment program consisted of 12 consecutive weekly sessions each lasting two hours. The first six parent sessions focused on parental behavior and health and the last six focused on child health behaviors. During the first hour, parents attended classes in their preferred language (English or Spanish) while children joined a class of their peers (typically divided by age: 5 and under, 6–9 years old, 10–12 years old, and 13 and older). Each session introduced a new behavioral topic (e.g., goal settings, privileges, positive reinforcement, rules and consequences), dietary topic [e.g., The Stoplight Diet (Epstein & Squires, 1988), the importance of eating breakfast, reading food labels, problem solving difficult situations], and exercise topic (e.g., decreasing sedentary behavior, planned vs. incidental exercise, cardio and strength training). The lessons are developmentally tailored despite using the same treatment manual (i.e., young children learn the stoplight diet by throwing empty food containers into a properly colored box, while older children learn the stoplight diet by discussing their ideal healthy meal). For the second hour of each meeting, adults and children participated together in a required group exercise activity supervised by an exercise leader. Participants were taught activities that could be completed at home without the use of expensive equipment (e.g., walking, home-made obstacle courses, tag, dancing). Families were also encouraged to exercise together at home throughout the week.

Data Analyses

An intent to treat analyses was completed. All participants randomized to a study condition (i.e., waitlist or treatment) were included in these intent to treat analyses. To address missing data, multiple imputation was performed using IBM SPSS Version 20 prior to intent to treat analysis. Fifteen imputations were computed using all available and relevant demographic and baseline information in the imputation model.

For families who were assigned to the wait-list group, only their wait-list data were included (not their treatment outcome data). No significant differences between the waitlist control and treatment condition groups were found for demographics and main outcome variables at baseline, confirming the effectiveness of randomization. No differences were found on

demographic variables (gender, race, ethnicity) between treatment group members who dropped out in comparison to those who completed. Given the nature of the imputed data, outliers on change scores were not excluded from the intent to treat analysis. One mother was pregnant during the weight management program, and therefore was excluded from parent BMI analyses. Multiple regressions were conducted to examine the interaction effect of group*time on changes in parent BMI and child BMIz and child dietary and physical activity behaviors. Given the children represented a wide range of ages, age was also examined as a predictor in the multiple regression. Additionally, number of treatment sessions attended was also entered as a variable to examine a possible treatment dose effect. Post hoc paired sample t-tests examined within group differences.

Results

Change in Parent BMI

For the treatment group, BMI went from 32.54 at pre-treatment to 30.94 at post-treatment. BMI for the waitlist group was 34.17 at pre-treatment and 33.57 at post-treatment. No group*time interaction was found, $t = -.83$, $p = .42$. Treatment sessions attended was not related to change in parent BMI.

Change in Child BMIz score

BMIz score for the treatment group was 2.33 at pre-treatment and 2.33 at post-treatment. For the waitlist control group, child BMIz score went from 2.54 at pre-treatment to 2.46 at post-treatment. No group*time interaction was found, $t = 1.06$, $p = .30$. Child age and number of treatment sessions attended were also not related to change in child BMIz score.

Change in Child Diet

No significant group*time interactions were found for red food servings, fruit servings, daily kilocalories, percentage of calories from fat, vegetables servings, or sugar sweetened beverage servings. Child age and number of treatment sessions attended were also not significantly related to change in daily kilocalories, sugar sweetened beverages servings, percentage of calories from fat, fruit servings, vegetable servings, and red food servings.

Change in Child Physical Activity

Total number of minutes of moderate, vigorous, and very vigorous activity was 62.43 minutes for the treatment group at pre-treatment and 39.11 minutes for the treatment group at post-treatment. For the waitlist group, minutes of total moderate, vigorous, and very vigorous activity were 54.80 at pre-treatment and 39.89 at post-treatment. For total number of minutes of physical activity, no interaction effect between group and time was found, $t = -.34$, $p = .73$.

Discussion

The current study examines the effectiveness of *Healthy Hawks Super*, a family-based, behavioral intervention targeting both parent and child weight loss, when implemented with a diverse and heterogeneous sample recruited through community and clinical outlets. The

treatment group did not show greater reductions in child BMIz or parent BMI, and dietary variables also did not improve more significantly for the treatment group. Child age and number of treatment sessions attended also did not relate to outcomes.

Contrary to expectations, *Healthy Hawks Super* did not result in statistically significant BMIz score or BMI improvements for children and parents. Given the duration of the program (i.e. 12 weeks), it is possible that families changed important weight-related behaviors that may affect their BMI over a longer period rather than more immediately. The original *Healthy Hawks* program that devoted 12 weeks to targeting child weight did result in significant decreases in child BMIz score (Davis, 2011; Dreyer et al., 2009; Landrum et al., 2008), and it may be the case that this entire time period needs to be devoted to targeting children to see results. It is also possible that splitting the 12 week intervention to only focus on children for six weeks diluted the effect for children.

Neither group demonstrated a significant change in physical activity, though some non-significant decreases were observed. Lack of overall changes in physical activity may be explained by high activity at baseline. Children are often quite active at baseline with studies indicating an average of 3 hours per day of moderate to vigorous physical activity (Nader, Bradley, Houts, McRitchie, & O'Brien, 2008). This high activity level at baseline was seen in our sample with our data indicating children were exceeding the current recommendations of 60 minutes of moderate to vigorous physical activity prior to any sort of intervention. Thus, ceiling effects seem plausible. A possible explanation of the slight decreases in physical activity is that children can be reactive to wearing a device measuring physical activity (Motl, McAuley, & Dlugonski, 2012) such that the device itself can result in increased activity levels. It may be that this reactivity led to higher activity levels during baseline, when the device was novel, but activity dropped to normal, more representative levels at follow-up. However, it is important to note that our program has found significant clinical value in use of physical activity monitors. We have found the monitors to be excellent teaching tools due to their ability to display activity levels on a moment-by-moment graph allowing parents and children to see when they are most active.

Interestingly, treatment dose (i.e., number of treatment sessions attended) did not relate to outcomes, which is contrary to the idea that families attending more sessions would have demonstrated greater treatment gains. This is consistent with the finding that the treatment group did not show greater improvements than the waitlist group, because attending sessions was not associated with greater improvements. *Healthy Hawks Super* should be modified given the current curriculum and program does not appear effective for treating overweight in children or their parents.

Importantly, the current study did demonstrate the feasibility of conducting an intervention targeting both child and parent weight management with a diverse and heterogeneous sample. Over 60% of children assigned to the treatment condition completed at least 50% of treatment sessions and both baseline and post-treatment follow-ups without the need for payment for their participation in the study. This is especially encouraging given many of the participating families had low incomes and were covered by Medicaid, meaning the families may have had challenges and limited resources for attending weekly treatment sessions over

an extended period of time (i.e., 12 weeks). Group treatment can improve efficiency for clinicians by allowing them to reach large numbers of patients simultaneously. Additionally, treatment costs may be reduced for patients and families. By targeting behavior changes in both parents and children, clinicians may also double the number of “patients” in the same billable hour – from simply a group of children to a group of children and a group of adults. Our research supports previous literature that groups should focus on the core areas of diet, physical activity and behavioral topics.

Research utilizing community and heterogeneous samples, such as the current study, has an opportunity to contribute significantly to clinical science by investigating the effectiveness and appropriateness for implementation of a treatment protocol outside of a well-controlled research setting. The current study included a broad age range and ethnically diverse sample, which is consistent with past recommendations that behavioral interventions for pediatric overweight should be more broadly accessible (Barton, 2010; Jelalian et al., 2014). By recruiting such a broad sample, this study and program were conducted in an ecologically valid manner, and may be a more accurate representation of the effectiveness and applicability of such interventions in a broader, more general population.

There are some limitations of the current study that should be addressed in future research. First, despite the random assignment, the two groups were not equivalent on child BMIz score or adult BMI at baseline (Table 2). Furthermore, all of the families were treatment seeking, and may be more motivated to engage in behavior change compared to non-treatment seeking families. Thus, the generalizability of the results may be limited to treatment seeking families. This highlights the importance of having both highly controlled research studies with highly selected participants for internal validity as well as studies such as the present one that incorporate a more heterogeneous sample more characteristic of treatment seeking populations. Lastly, since BMI was the only parent-measure taken, less can be concluded regarding potential reasons for this change (e.g., parental change in physical activity, nutrition) and how parental changes may be related to child changes. Future research is also needed to examine the impact of programs targeting both parents and children on other parent outcome variables and to examine the potential long-term effectiveness of such a program for participants as well as nonparticipating family members.

Implications for Practice

While past research found a 12-week version of *Healthy Hawks* focused on child health specifically effective for improving BMI and health behavior outcomes for both children and parents (Davis et al., 2013), a similar length program targeting both child and parent health was ineffective. Therefore, interventions that wish to address parent health should not attempt to integrate these concepts into already existing pediatric programs without making other adjustments to the length and structure of the program. Interventions that choose to address both child and parent health may need to include additional sessions in order to make sure efforts are concentrated enough to lead to effective results. However, it may be the case that attempting to focus on both parent and child health interferes with parents’ focus on making changes to impact the health of their child, and the value of focusing on both parent and child health outcomes directly in the same interventions needs to be

critically considered. This is especially true given programs addressing change in child behaviors specifically through family-based change have inadvertently led to changes in parent BMI (Davis et al., 2013)

This study also exemplifies the importance of integrating outcomes research and clinical practice. Critical evaluation of treatment programs using randomized and intent-to-treat designs is necessary, because even programs containing components believed theoretically to be of value may not in actuality be effective (as was the case in the current study). Therefore, it is important that practitioners consider the research supporting their therapeutic approach and seek to integrate outcomes research into their own clinical practice.

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Figure 1.
CONSORT diagram.

Table 1

Participant Demographics

	Treatment Group	Waitlist Control Group	Total
Child Demographics			
Gender			
Male	23 (42.59%)	25 (59.52%)	48 (50.00%)
Female	31 (57.41%)	17 (40.48%)	48 (50.00%)
Ethnicity			
Caucasian	12 (22.22%)	8 (19.05%)	20 (20.83%)
African American	13 (24.07%)	7 (16.67%)	20 (20.83%)
Latino	29 (53.70%)	27 (64.29%)	56 (58.33%)
Language			
Spanish	28 (51.85%)	22 (52.38%)	50 (52.08%)
English	26 (48.15%)	20 (47.62%)	46 (47.92%)
Insurance Type			
No Insurance	6 (11.11%)	2 (4.76%)	8 (8.33%)
Medicaid	38 (70.37%)	33 (78.57%)	71 (73.96%)
Private Insurance	10 (18.52%)	7 (16.67%)	17 (17.71%)
Age <i>M(SD)</i>	10.05 (3.52)	10.00 (3.49)	10.03 (3.49)
Baseline BMIz <i>M(SD)</i>	2.33 (0.47)	2.55 (0.72)	2.42 (0.59)
Parent Demographics			
Age <i>M(SD)</i>	41.17 (8.20)	36.45 (7.13)	38.98 (8.03)
Baseline BMI <i>M(SD)</i>	32.41 (6.33)	35.57 (7.90)	33.71 (7.14)