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Development and Feasibility of an Obesity Prevention Intervention for Black Adolescent Daughters and Their Mothers

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Abstract
Black female adolescents and women have disproportionately higher rates of obesity than their racial/ethnic counterparts. There is an urgent need to address obesity prevention in Black adolescent females through interventions that enhance lifestyle physical activity and improve dietary behaviors. Middle adolescence presents an important opportunity to strengthen the daughter–mother bond and improve healthy behaviors such as physical activity and dietary intake. Because of the intersection of adolescent development, culture and structural racism, it is essential to include mothers; however, this approach is understudied in the literature. This pre-pilot proof of concept study, *Black Girls Move*, was conducted using a 12-week pre–post within-subjects design to assess feasibility of conducting and delivering the *BGM* intervention, program satisfaction, and ability to obtain outcome measures in Black ninth and tenth grade daughters and their mothers. Twenty-two dyads were recruited and 14 dyads completed baseline assessments; however, only eight daughters and their mothers attended the first session and remained for the entire study. All dyads had valid objective and self-reported physical activity data. However, two of eight daughters and one mother provided self-reported dietary data that were considered invalid. All individual sessions were rated highly. Excellent attendance, retention, and satisfaction among participants suggest that we succeeded in developing an accepted, culturally relevant intervention. This lifestyle intervention would be strengthened by modifications to recruitment and retention, as well as incorporation of a computerized dietary assessment tool, a tailored dietary app for self-monitoring, and increased photo-based and group homework activities.

Keywords: dietary and physical activity behaviors, Black female adolescents, obesity prevention, feasibility, satisfaction

Obesity and severe obesity have reached epidemic proportions in the United States, with Black female youth and women having disproportionately higher rates than their racial/ethnic counterparts (Ogden et al., 2016). This trend has persisted for nearly two decades (Skinner & Skelton, 2014). During childhood, Black girls have similar rates of obesity to other race/ethnicities; however, the disparity in obesity rates begins in adolescence (Ogden, 2014). Among Black female adolescents (ages 12–19 years), 24.4% are obese (body mass index [BMI] > 95th percentile) and 12.7% severely obese (BMI > 120% of the 95th percentile) compared to 20.4% and 7.4% and 22.8% and 8.3% for their non-Hispanic White and Hispanic peers respectively (Ogden et al., 2016). Once obesity is established in adolescence, it is hard to reverse (de Onis & Lobstein, 2010). Among Black women aged 20–39 the prevalence of obesity (BMI > 30) rises to 56.7%, and severe obesity (BMI > 40) rises to 16.2% compared to 33.2% and 10.0%, and 43.3% and 8.9%, in non-Hispanic White and Hispanic women respectively (Flegal et al., 2016). Youth with obesity are at greater risk for many adverse physical, social, and emotional issues, including asthma, sleep apnea, type 2 diabetes, heart disease, social isolation, depression, and low self-esteem (Güngör, 2014); Pulgaron, 2014). Obesity in adulthood is associated with higher early mortality (Ebbeling et al., 2002). There is an urgent need to address obesity in Black female adolescents through preventive interventions that enhance lifestyle physical activity (PA) and improve dietary behaviors (Wright, 2017).

Cultural factors that may influence health behaviors of Black female adolescents include body image attitudes in which they are more likely than non-Hispanic White female adolescents to consider larger body types as acceptable or ideal (Robinson et al., 2012). Black women are

increasingly rejecting the societal convention in which Black female body image (e.g., skin tone, hair and body shape) is considered less desirable than non-Hispanic White female body image (Awad et al., 2015). Embracing and accepting one's body size fosters higher self-esteem in female adolescents, but care needs to be taken that it also contributes to healthy participation in physical activity or other behaviors that reduce risk for obesity (Robinson et al., 2012; Joseph et al., 2017). Unfortunately, Black female adolescents have reported significantly less recreational physical activity or sports (e.g., bicycling, basketball, or swimming) outside of gym class than their non-Hispanic White peers (Kimm et al., 2002). Many Black female adolescents perceive a muscular appearance as undesirable, inhibiting their interest in participation in sports (Wright, 2017).

Black female adolescents' and women's dietary behaviors are also influenced by their unique cultural identity. There is a familial sense of belonging associated with where and with whom one eats, as well as eating traditional foods that can be high in fat, sodium, and/or sugar (Tate et al., 2015). Of particular importance is that structural racism causes some Black families to live in low-income, segregated communities and obesogenic environments (Pool et al., 2018; Bell et al., 2019; Cozier et al., 2014). These obesogenic environments are characterized by less access to safely walkable streets and healthy foods, and they are associated with increased incidence of obesity (Pool et al., 2018; Bell et al., 2019; Cozier et al., 2014). These cultural and environmental factors are important to consider in the design of obesity prevention interventions for Black female adolescents and women.

Adolescence represents a unique and important opportunity to strengthen the daughter–mother family bond and improve healthy behaviors such as physical activity and dietary intake. It is a time that female adolescents may require maternal support to understand the developmental and cultural complexities they face in adopting healthy behaviors (Winkler et al., 2017). A review of factors related to obesity and overweight in Black female adolescents revealed a significant correlation between mother and daughter weights (Winkler et al., 2017). In our cross-sectional study of 43 Black daughter–mother dyads with 10–12-year-old daughters, findings suggested that daughters' dietary behaviors mirrored those of their mothers (Reed et al., 2013). In fact, even when fathers are in the home, mothers or mother-figures are still the primary influence, because they are typically responsible for the majority of household duties, including grocery shopping, meal preparation, and cooking (Fielding-Singh, 2017; Lachance-Grzela, 2010). Discerning the family interactions that result in these relationships between mothers and daughters needs future exploration.

A recent literature review of 153 randomized control trials of children and adolescent obesity prevention interventions published from 1980–2018 (Brown et al., 2019) revealed only one adolescent intervention (Shin et al., 2015) culturally tailored for Black adolescents, and it did not include a parent or consider gender differences. In our focus groups with 24 Black daughters aged 14 to 17 years and their mothers, we found that for physical activity and dietary interventions, participants preferred a female-focused, rather than mixed gender, intervention (Reed et al., 2017). Daughters clearly preferred groups of daughters with their mothers rather than separate groups or Black adolescent daughters without mothers included at all (Reed et al., 2017). Our integrative review of obesity prevention interventions for Black female children and adolescents that included mothers, however, revealed that no daughter–mother interventions included Black female adolescents ages 13 to 17 (Reed et al., 2015).

In summary, cultural, environmental, and family factors contribute to obesity, and middle adolescence is an important developmental period for female adolescents. In this manuscript, we (a) describe the development of the Black Girls Move (BGM) intervention, a school-linked physical activity and dietary behavior lifestyle intervention for Black adolescent daughters and their mothers, and (b) present findings from our pre-pilot, proof-of-concept study. The pre-pilot study assessed (a) feasibility of conducting the study (recruitment/retention), (b) feasibility of delivering the intervention (program attendance, monitoring physical activity and dietary goal setting, and homework submission), (c) program satisfaction, and (d) feasibility of obtaining outcome measures (physical activity, diet, height, and weight).

Black Girls Move Intervention

Theoretical Foundation

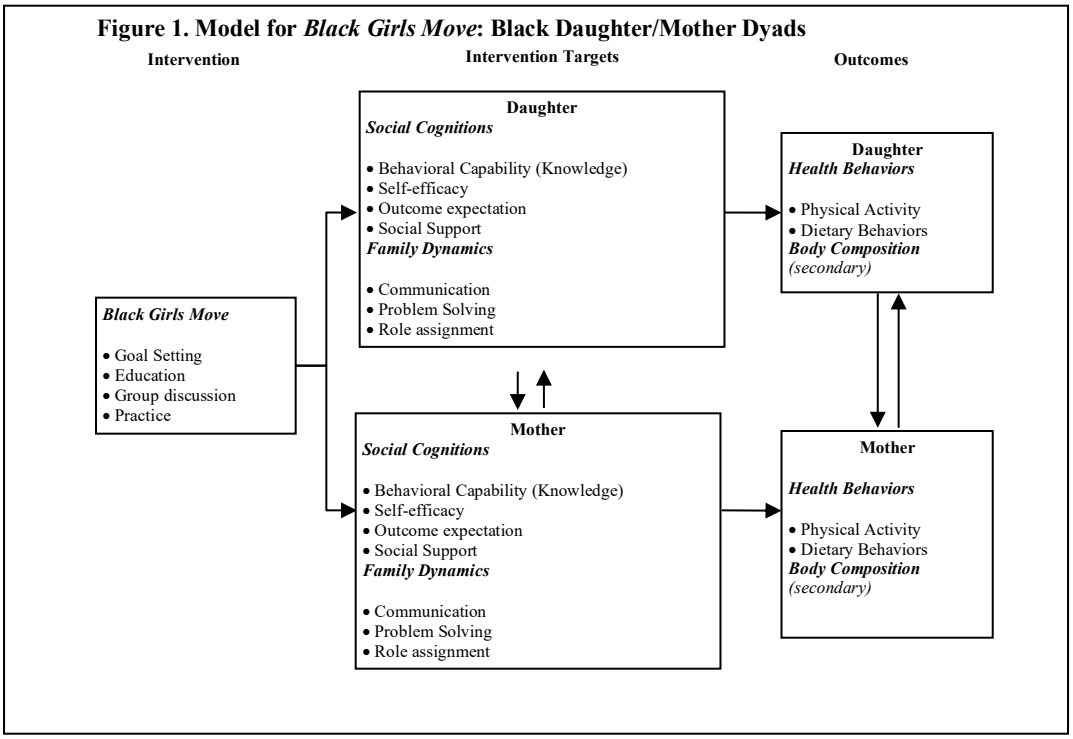
Dual process theories have been used to examine adolescents' and adults' decision making and judgment around risky behaviors such as violence prevention and sexual activity, as well as physical activity and dietary behaviors (Dansereau et al., 2013). We chose the dual theories of Social Cognitive Theory (SCT) (Reed et al., 2015; Bandura, 2004) and Family Systems Theory (FST) (Epstein et al., 1983; Kitzman-Ulrich et al., 2010) as approaches to guide the development of the BGM intervention (Figure 1).

Development of the Black Girls Move Intervention

The BGM intervention is loosely modeled after the evidence-based Diabetes Prevention Program (DPP) (Knowler et al., 2002) The original DPP included an intensive lifestyle intervention for high risk individuals 25 years and older with a mean BMI of 34.5 kg/m^2; nearly 45% were from minority groups (Knowler et al., 2002). The active lifestyle intervention included a lifestyle change core curriculum incorporating healthy and reduced fat eating habits, problem solving, increased physical activity, and more. The structure, many of the topics, and strategies used in DPP were incorporated into the BGM program (Tang et al., 2014; Trickett, 2009; Knowler et al., 2002). Because successful outcomes were achieved for diverse age, gender, and race/ethnicity groups (Dodani & Fields, 2010), it is considered a gold standard intervention (Caban & Walker, 2006; Trickett, 2009; Dodani & Fields, 2010; Ciemins et al., 2018). It has not been adapted, however, for Black adolescent daughter-mother dyads using a family

theoretical approach. To develop BGM, we used an iterative process including clinical expert interviews and daughter-mother focus groups to modify the DPP intervention. This process generated individual and family grounded content and established an acceptable format for Black female adolescents and their mothers.

Figure 1. Model for *Black Girls Move*: Black Daughter/Mother Dyads



Methods

First, 60-minute individual interviews were held with four clinical experts (two school nurses, a pediatric dietitian, and a pediatrician) to address the content and format for delivery of BGM. Clinical experts were initially asked to review content for physical activity and dietary behavior based on elements of SCT and FST. Experts' responses were organized into a grid by elements of SCT and FST to cover content for six group sessions. Once content was identified, the delivery format for each topic, based on the best fit with elements of SCT and FST, was incorporated into the grid for the group sessions (Table 1). The clinical experts received $30 after their interviews.

Second, a 90-minute focus group was conducted with four 14–15-year-old Black daughter–mother dyads to further refine the intervention. During the focus group, the daughter–mother dyads were shown the content and format for three of the proposed group sessions. They were asked to discuss and provide feedback on (a) placement and implementation of the physical activity and dietary behavior content; (b) delivery format for group sessions, as well as the timing and ordering of activities; and (c) selection of accompanying video materials. In addition, the dyads were asked to provide feedback on goal setting and monitoring, including wearing and charging of Fitbits; frequency of entering dietary intake into the Fitbit; use of social media such as Facebook to facilitate the intervention; and provision of a reward system. After reviewing physical activity and dietary behavior content and format, participants also provided feedback on the proposed goal setting process. Last, dietary homework assignments to practice behaviors and communication were developed for daughters and mothers to complete after each group session. Daughters and mothers each received $25 for participation in the focus group.

Group Sessions

Each group session was scheduled for two hours. The first hour was devoted to physical activity content and the second hour to dietary intake. Near the end of each two-hour session, participants reviewed their Fitbit step and dietary goal progress and set a new goal, with feedback from facilitator. The physical activity hour began with a video with discussion followed by engaging physical activity. The dietary intake hour began with an engaging dietary activity followed by dietary video with discussion (Table 1). Specifically, the delivery format includes (a) videos with role-modeling and facilitator-led discussion to provide vicarious experience; (b) practice sessions for behavioral capability and rehearsal; (c) daughter–mother group discussion for problem solving, communication, and role assignment; (d) goal setting for self-regulation/control; and (e) facilitator feedback toward goal achievement to provide positive reinforcement. Case scenarios with discussion were developed for each of the six group sessions and used to demonstrate and practice problem solving, communication and role assignment.

Goal Setting

The physical activity goal setting process for BGM is based on our prior work and was intended to be established by the interventionist in conjunction with each participant. The physical activity goal is set to encourage each participant to increase daily physical activity to at least 3,000 steps above her baseline (approximately 30 minutes of physical activity at a moderate walking pace) by the end of the intervention period (Wilbur et al., 2016). Objective measures of steps taken per day and per week were obtained at baseline and the end of the intervention with a Lifecorder EX (NL2200) accelerometer. The baseline accelerometer also provided the step count used to establish the initial physical activity step goal. At the first group session, the step goal was entered into a self-monitoring Fitbit Charge HR (Fitbit), a slim wristband device worn all day. Participants monitored their own physical activity in relation to their step goals through the Fitbit application on iOS or Android mobile devices and the Fitbit.com website, which tracks steps. The software signals alerts as the physical activity goals (steps) are approached and then again when reached. Once participants register for a free account on Fitbit.com, their physical activity data are synced on their own mobile device or personal computer for real-time access. To gradually meet their goal, participants add at least 600 steps over their baseline measured step count at each subsequent group session over the course of the intervention, until 3,000 steps over their baseline step count is reached. There is an option to compare performance with other daughter–mother dyads and congratulate others within the group on their progress via a built-in “like” feature (Fitbit Inc, 2020).

Dietary goals were set for each participant individually using guidelines established in consultation with a nutrition expert (Rigby et al., 2020). Self-monitoring was designed to be achieved with the Fitbit. Daughters and mothers were asked to enter their daily beverage and food consumption into the online tracking database for two weekdays and one weekend day. The Fitbit.com website tracks calories consumed and burned. Alerts sound as dietary (calorie consumption) goals are approached and then again when reached. There is also an option to compare dietary goal performance with those of other participants and send congratulatory messages.

The Fitabase.com dashboard allowed the research team to see all recently synced devices, battery levels, and current data from all users. These data are used to reset goals at each group session, where the interventionist, in collaboration with each participant, can make changes to the suggested goal.

Homework

Homework for physical activity included wearing the Fitbit every day to monitor progress toward step goal. Homework for dietary intake included photographs and writing of a meal (session 1); two food labels, comparing them to a personal healthy eating goal (session 2); a grocery receipt and two healthier substitutions (session 3); and preparing healthy snacks to meet personal healthy eating goals (sessions 4 and 5) (Table 1). Photographs of homework assignments were to be texted to the interventionist and other participants and used for discussion via text among the group members and in the next group session.

Intervention Pre-Pilot Study Methods

The proof-of-concept pre-pilot test of the initial iteration of BGM was conducted using a 12-week pre–post within-subjects design.

Setting

The setting was one public high school located in a large Midwest city serving 398 students in 9th through 12th grade. The high school served a diverse (79.9% Black, 17.3% Hispanic), predominantly low-income (85.4% qualify for free lunch) student population. (Chicago Public School, 2020).

Participants

Inclusion and Exclusion Criteria

Inclusion criteria for daughters were (a) Black, (b) not currently pregnant, (c) grade 9 or 10, and (d) overweight/obese, or normal weight but at risk for weight gain because of poor diet or inadequate physical activity. To identify the daughter’s weight status daughters were asked, “Has your primary health care provider said that you are underweight, overweight, or obese?” If the daughter was uncertain, this information was asked of her mother. Poor/inadequate diet was assessed by asking daughters if they eat five servings of fruits and vegetables per day (yes/no). Poor/inadequate physical activity was assessed by asking daughters if they currently exercise 60 minutes per day, 7 days per week (yes/no).

Inclusion criteria for the mothers were (a) English-speaking, (b) biological or surrogate mother of an eligible daughter, (c) the person primarily responsible for meals in

the household, and (d) not currently pregnant. Mothers provided consent for themselves and their daughters; daughters provided assent. The Institutional Review Board approved the study.

All daughters and mothers must already have internet access through an iOS or android smartphone, tablet, or personal computer. An exclusion criterion for both daughters and mothers was an eating or metabolic disorder without a health provider release. Also, the dyad was excluded if the mother had a systolic blood pressure >160 mm Hg or a diastolic >100 mm Hg or major signs or symptoms of cardiovascular disease or musculoskeletal problems made worse by physical activity based on Physical Activity Readiness Questionnaire, unless they submitted a health provider release (Warburton, et al., 2018)

Recruitment

Recruitment strategies can include passive or active recruitment (Sharp et al., 2008). Passive recruitment can include mass email communications and replenishing stacks of flyers at community locations, while active recruitment is described as in-person distribution of flyers, explaining the study, and same day screening. Additionally, active recruitment includes canvassing communities—that is, going door to door to businesses, health care facilities and churches to facilitate the institutional leaders' ability to recruit study participants (Sharp et al., 2008). Daughters were recruited with both passive and active strategies. The primary passive strategy was through flyers posted and distributed at the school (e.g., health clinic, main office, lunchroom, library, after-school activities). The flyers described the study, listed criteria for participation, and provided a telephone number and email for mothers to contact for further information. The active strategy was to have a research assistant (RA) available twice weekly at a designated common area at the school to hand out flyers and answer questions. Interested daughters completed a brief screener that requested their contact information. Mothers were passively recruited through a parent newsletter which briefly described the purpose of the study, inclusion criteria and researcher contact information. Mothers were also actively recruited, less frequently, at report card pickup days, monthly local school council meetings, and parent advisory board meetings. Prospective mothers were invited to contact the principal investigator or RA directly by telephone. If mothers did not call within seven days, study staff texted the initial contact person (daughter or mother) up to three times to remind them to have the mothers call back.

Measures

Demographics

Demographics obtained at baseline were adapted from the Youth Risk Behavior Surveillance Survey and Behavioral Risk Factor Surveillance Survey for daughters and for mothers, respectively (Kann et al., 2018). The daughter's demographic questionnaire included age, grade, race, and weight status. The mother's demographic questionnaire included age, race, marital status, and education.

Feasibility

Feasibility measures were obtained for four aspects of the study: (a) recruitment and retention, (b) delivery of the intervention, (c) program satisfaction, and (d) ability to obtain the outcome measures.

Recruitment and Retention. Recruitment and retention of mothers and daughters were tracked on a secure study database.

Delivery of Intervention. Attendance at the group sessions component of the intervention was tracked at each meeting for daughters and mothers to determine the proportion of participants who attended at least four of the six (66%) sessions. Feasibility of using the Fitbit for monitoring step goals was measured as the number of sessions in which daughters and mothers had valid Fitbit step data (i.e., ≥1,200 steps) for half or more (i.e., 7+) of the days during the two-week period before each session. Feasibility of monitoring dietary goals was measured by the number of days that daughters and mothers entered dietary intake in the Fitbit application; the minimum criterion was two days each week over the course of the intervention. Submission of at least 80% of the assigned homework activities was considered a feasible intervention.

Program Satisfaction. Daughters' and mothers' satisfaction were measured using a four-item, paper-and-pencil evaluation at the end of each group session. This tool assessed participants' satisfaction with the overall session, session activities, discussion, and group dynamics using a four-point scale. At the end of the intervention, participants completed a 16-item version of the Client Satisfaction Tool (Bear & Bowers, 1998). The Client Satisfaction Tool evaluates satisfaction across five domains (affective support, health information, decisional control, technical competencies, and accessibility) and overall satisfaction using a five-point scale (1 = strongly agree, 5 = strongly disagree). Lower scores indicated higher satisfaction. The Client Satisfaction Tool is scored as a single scale (with a maximum average score of 80) and had an original internal consistency of $\alpha = .95$ (Bear & Bowers, 1998) The measure was revised for use with our population to assess physical activity and dietary intake separately.

Ability to Obtain the Outcome Measures. Feasibility of obtaining outcome measures included successful completion of the physical activity and dietary self-report questionnaires, use of a device to monitor physical activity, and completion of height and weight.

Physical Activity Self-Report Questionnaires. The 3-Day Physical Activity Recall (3DPAR; Pate et al., 2003), a recall measure of 59 physical activities (grouped into sleep/bathing, eating, work, after school/spare time/hobbies/, transportation, physical activities/sports) done in the past 3 days, was administered to daughters (Pate et al., 2003). Feasibility of obtaining the physical activity self-report outcome measures was defined as completion.

Dietary Self-Report Questionnaires. A food frequency questionnaire (FFQ) was used as the outcome measure of usual dietary behaviors because it is a cost-efficient, reliable method (Hammond et al., 1993). The revised Block Kids 2004 Food Frequency Questionnaire (BKFFQ), (Cullen et al., 2008) reflects dietary behaviors over a one-week period for the daughters. The nutritional intake analysis for this study focused on select macro- and micro-nutrients and food groups. Researchers reviewed the BKFFQs for missing data during data collection. FFQs were considered invalid if either of the following conditions were observed: (a) daily energy was less than 500 kilocalories or (b) responses were inconsistent with previous linked responses. Feasibility of obtaining the BKFFQ self-report outcome measures was defined as completion of valid questionnaires.

Physical Activity Self-Monitoring. The daughters wore a Lifecorder EX (NL2200) accelerometer daily during waking hours for one week at baseline and one week at the end 12 weeks to record their steps (Wright, 2017; Crouter, Schneider, & Bassett, 2005). Based on our prior work, fewer than 1,200 steps were deemed either a device malfunction or failure to wear the accelerometer for an adequate amount of time during the day (Wilbur et al., 2016).

Dietary Self-Monitoring. Weeks had to have at least three days of valid data. Feasibility of obtaining the accelerometer outcome measure was defined as having valid data for both baseline and 12-week assessments.

Height and Weight Measurement. Daughter's BMI was calculated as weight in pounds divided by height in inches (squared) multiplied by 703 (Flegal et al., 2016; Ogden et al., 2016). BMI was measured with participants wearing light clothes and no shoes via a Seca stadiometer and a digital floor scale (Health-o-meter model #800KL) without shoes and weight measured to the nearest kilogram.

Procedures

A research team member contacted interested daughters and mothers by telephone, explained the study in more detail, discussed privacy/confidentiality issues, and screened for eligibility. Eligible and interested participants were scheduled for a baseline assessment at the school. At the baseline assessments, research team members reminded participants of the purpose of the study and questions were answered, assent and consent forms were signed, height and weight were measured, and mother's blood pressure was taken to screen for elevated blood pressure. Mothers with elevated blood pressure were required to obtain medical clearance from their primary care providers. Participants completed the questionnaires (food frequency and physical activity questionnaires). Dyads were each given an accelerometer, blinded to them, to wear for the next seven days to provide an objective measure of physical activity and obtain baseline steps.

Participants received reminder calls/texts the day before the scheduled group sessions. Each of the six group sessions lasted two hours and took place over a 12-week period on Saturdays at a location close to the participants' school. Daughters and mothers were each given a Fitbit at the first group meeting to wear for the entire study period and keep at the conclusion of the study. At each of the group meetings, gifts were matched to the content of the intervention (e.g., water bottles for the discussion on reducing sugar-sweetened beverages). Following each group session, the satisfaction questionnaire was administered.

At the end of the 12-week intervention, participants returned for post-intervention assessments, including physical activity and diet questionnaires, Client Satisfaction Tool, height, weight, and mothers' blood pressures. Refreshments, parking, and childcare were provided at assessments and group meetings. A $20 gift card was given to each daughter and mother after completion of each of the two baseline and post-intervention assessments. Lifecorder EX (NL2200) accelerometers were given to participants to wear for one-week post intervention and were retrieved by RAs.

Results

Analyses

Descriptive statistics (mean/standard deviation and count/percent) were used to describe the sample, the indicators of feasibility, and satisfaction. We used *t*-tests and chi-square analyses to compare intervention participants to nonparticipants. Given the single-group design, we did not use inferential statistics for feasibility and satisfaction.

Demographics

Data were collected during the 2016–2017 school year. Participants included eight Black 9th and 10th grade daughters, ages 15.1 ± 0.8 years old (mean ± *SD*) and their mothers (36.6 ± 2.8 years old; Table 2). Overall, the participant mothers had some college education or were college graduates (57% and 29%, respectively), self-reported low-income (71% household income ≤ $20,000), and were never married or divorced/separated (57% and 27%, respectively). Most daughters had measured weight categories of normal weight (63%) while most mothers measured as obese (57%); 25% daughters and 14% mothers measured as severely obese. The dyads who were nonparticipants (completed baseline assessments but did not attend session 1) had similar demographic characteristics, with no differences between groups. The nonparticipant daughters perceived themselves at a slightly higher weight than participant daughters. However, there were no perceived differences in daughter or mother measured weight categories.

Table 2.
Daughter and Mother Demographic and Weight Status by Intervention Participation

	Participants (Attended Session 1)		Nonparticipants	
Demographic Characteristics	Daughter (*n*=8)	Mother (*n*=7)	Daughter (*n*=6)	Mother (*n*=6)
Age - *M* (SD)	15.1 (0.8)	36.6 (2.8)	15.0 (1.1)	39.0 (5.8)
Daughter Grade - *n* (%)				
9th	2 (25.0)		2 (33.3)	
10th	6 (75.0)		6 (66.7)	
Mother Highest Level of Education - *n* (%)				
High School Graduate or GED		1 (14.3)		2 (33.3)
Some College		4 (57.1)		3 (50.0)
College Graduate		2 (28.6)		1 (16.7)
Mother Marital Status - *n* (%)				
Married		0 (0.0)		2 (33.3)
Divorced/Separated		2 (28.6)		1 (16.7)
Never Married		4 (57.1)		2 (33.3)
Other		1 (14.3)		1 (16.7)
Mother Employed - *n* (%)		5 (71.4)		4 (66.7)
Household Income - *n* (%)				
Less than $10,000		1 (14.3)		1 (16.7)
$10,001- $20,000		4 (57.1)		4 (66.7)
$35,001- $50,000		1 (14.3)		1 (16.7)
Greater than $50,000		1 (14.3)		0 (0.0)
Self-reported Weight Category - *n* (%)				
Very Underweight	0 (0.00)	1 (14.3)	0 (0.0)	0 (0.0)
Slightly Underweight	2 (25.0)	2 (28.6)	0 (0.0)	0 (0.0)
About the right weight	4 (50.0)	0 (0.0)	1 (16.7)	1 (16.7)
Slightly Overweight	2 (25.0)	2 (28.6)	4 (66.7)	2 (33.3)
Very Overweight	0 (0.0)	2 (28.6)	1 (16.7) *	3 (50.0)
Measured Weight Category - *n* (%)				
Underweight	1 (12.5)	2 (28.6)	0 (0.0)	0 (0.0)
Normal Weight	5 (62.5)	0 (0.0)	1 (16.7)	0 (0.0)
Overweight	0 (0.0)	0 (0.0)	0 (0.0)	1 (16.7)
Obese	0 (0.0)	4 (57.2)	2 (33.3)	4 (66.7)
Severe Obesity	2 (25.0)	1 (14.3)	3 (50.0)	1 (16.7)

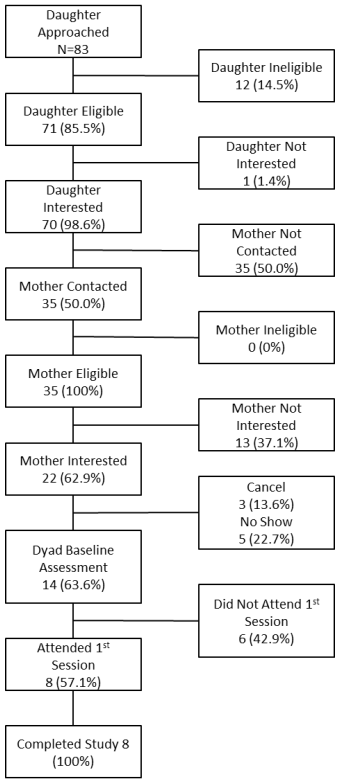
Note. * indicates the difference between participants and nonparticipants was statistically significant.

Feasibility

Recruitment and Retention

Of 83 daughters approached for participation, the majority (86%) were eligible, and nearly all eligible daughters (99%) expressed interest (Figure 2). Of the 35 mothers (50%) who were successfully contacted, all were eligible and 22 (63%) were interested. Of these 22 dyads with both daughters and mothers interested and eligible, 14 (64%) completed baseline assessments and were scheduled to attend the first session. Six of the 14 dyads (43%) failed to attend the first session and were excluded from future sessions. All daughters (n = 8) and mothers (n = 7; one mother had two daughters participating) who attended the first session completed the study and follow-up assessment (see Figure 2).

Figure 2. Consort Table



Feasibility of Intervention Delivery

Attendance. Seven of the eight daughters (87.5%) attended at least four of the sessions. One daughter attended three sessions, although her mother attended five sessions. One daughter attended one session alone because her mother had to work. One daughter attended a session virtually.

Monitoring Goals and Homework. Six daughters (75.0%) had adequate Fitbit data for four of five sessions. Although the original plan was to track (input) dietary data for two days each week, none of the participants completed this assignment before Session 2. The investigators decided that entry of dietary data into Fitabase was not feasible in this sample.

For the homework assignments, six of the seven dyads (85.7%) submitted pictures in response to Session 1 (photo of meal); none of the dyads submitted a picture for Session 2 (two food labels); one dyad (14%) submitted a picture for Session 3 (grocery receipt); and six dyads (85.7%) submitted pictures for Sessions 4 and 5 (preparing healthy snacks).

Program Satisfaction

All individual sessions were rated highly. Eighty-six percent of daughters and 100% of mothers rated all sessions as "very nice"; 94% of daughters and 92% of mothers rated activities as "teaching a lot"; 70% of daughters and 97% of mothers rated discussions as "very helpful"; 96% of daughters and 97% of mothers rated group members as "very supportive." At the end of the intervention, average scores on the Client Satisfaction Tool were 1.11 (SD = 0.15) for daughters and 1.07 (SD = 0.14), indicating high satisfaction.

Feasibility of Obtaining Outcome Measures

All eight daughters and all seven mothers achieved valid accelerometer data (i.e., 1,200 or more steps on three or more days) at the baseline measurement. At the week 12 assessment, seven daughters (87.5%) and all mothers achieved valid accelerometer data. For self-report measures of physical activity, all daughters completed the baseline assessments and six daughters (75%) completed the 3DPAR week 12 assessment. All mothers completed the baseline and week 12 IPAQ assessments.

For the Block FFQs, all daughters and mothers had valid FFQ data at baseline. However, two of the eight daughters and one of the seven mothers had invalid FFQs at week 12 because they reported energy intakes that were implausible. For BMI measurements, all daughters and mothers completed the baseline biometric measurements, while seven daughters (87.5%) and six mothers (85.7%) completed the measurements at week 12.

Discussion

The purpose of this pre-pilot, proof-of-concept study was to assess feasibility of conducting (i.e., recruitment and retention) and delivering the Black Girls Move (BGM) intervention (i.e., attendance, monitoring goals, and homework), program satisfaction, and ability to obtain outcome measures. The study demonstrated that BGM, a school-linked physical activity and dietary behavior lifestyle obesity prevention intervention, was feasible for Black adolescent daughter–mother dyads. The high participant satisfaction suggested successful cultural adaptation, which should be further developed. However, based on the findings, future modifications are suggested regarding recruitment, retention, intervention strategies, and outcome measures.

Using both active and passive means of recruitment within the school setting, we successfully identified eligible daughters who expressed interest in the study. Using predominantly passive recruitment methods to reach the mothers, though, we lost half of the interested daughters because we could not contact their mothers. Prior physical activity intervention studies have relied on more active recruitment strategies, such as endorsements from key community leaders, that can increase contact and build relationships with mothers (Sharp et al., 2008). Potential endorsements on recruitment materials should include key school members such as prior participants, local school council members or principals (Wallace & Bartlett, 2013). Referrals from institutional leaders as trusted individuals in the community are an important recruitment strategy to use with Black female participants (Webber-Ritchey et al., 2020). Future active recruitment of mothers should incorporate personal contact phone calls or personal engagement.

Nonparticipants for this study were considered those who completed baseline assessments but did not attend session 1. For example, among dyads who were interested and met inclusion criteria, nearly one-third did not attend the baseline assessment and close to half (43%) of those who completed baseline assessment failed to attend the first group session—and thus were not included in the study. Due to the slightly higher number of nonparticipant daughters with self-reported weight as “very overweight,” there is some indication that the daughters who could have benefited from participation in BGM were not given an adequate opportunity to participate. Given the number of known barriers to participation for Black female adolescents and women, which include competing home, school, and work responsibilities as well as adverse health conditions, it is important to offer make-up sessions. (Wallace & Bartlett, 2013; Taani et al., 2020). The DPP, which BGM was loosely based on, offered make-up sessions as an optional strategy to researchers; in BGM, make-up sessions should be a required component (Knowler et al., 2002). Additionally, BGM should consider virtual make-up sessions as an alternative session option. Flexibility in offering baseline assessment appointments, as well as alternative or make-up sessions, should be incorporated into BGM to improve participant recruitment and retention (Wallace & Bartlett, 2013; Taani et al., 2020).

Attention also needs to be paid to adjusting the dietary self-monitoring component of the BGM intervention. By the second session none of the dyads adhered to inputting dietary data in Fitbit for three days. They anecdotally reported that inputting dietary intake took too much time and was burdensome. Thus, they did not benefit from feedback provided by Fitbit. A systematic review of mobile apps used in health behavior interventions since 2014 found that participants were most likely to use and have confidence in dietary apps that were functional and easy to use (Payne et al., 2015). A recent study that assessed the quality of mobile apps aimed at improving eating behavior reported FoodStand as the top-rated app (Moseley et al., 2020). FoodStand provides self-monitoring and rewards in a simple guided experience to build one healthy eating habit at a time. For example, participants can be challenged to reduce sugar-sweetened beverages in session 1, monitor portion sizes in session 2, and remove added sugar from breakfast in session 3. Introducing one targeted behavior change at a time allows participants to celebrate accomplishments and further engage in the intervention. BGM should consider the need for dietary self-monitoring applications that offer an alternative to recalling and inputting dietary intake.

BGM homework submissions were highest for sessions that encouraged participants to share pictures of foods they prepared via group texts. Pictures shared by the dyads of daughters and mothers fostered increased group engagement in between sessions when participants encouraged, complimented, and helped each other with recipes and food choices. A similar approach could be used to share photos of creative and enjoyable ways they found to engage in physical activity (Taani et al., 2020). Text messaging seems to be an effective means to remind participants of meetings; thus it could be expanded to remind participants to wear their Fitbit and respond to dietary monitoring. Leveraging the use of photos to engage in homework activities and text messaging as reminders should be explored in future interventions.

Lastly, BGM participants reported that the sessions were very nice, they learned a lot, and had helpful discussions, which suggests the successful cultural adaptation of the intervention for the target population (Joseph et al., 2017). The intervention paid careful attention to incorporating community and societal factors often found to influence dietary and activity behaviors of Black female adolescents and women (Dietz, 2019; Pool et al., 2018), such as witnessing drive-by shootings or police officer shootings, food deserts, and low-quality housing. However, to achieve optimal obesity prevention outcomes (Dietz, 2019), studies suggest that adapted behavior capacity interventions should also directly address both structural and interpersonal experiences with racial discrimination that impact physical activity and dietary behavior. Unsafe neighborhoods, food deserts, low-quality housing, and interpersonal experiences with racial discrimination can impact the physical activity and dietary behavior choices of Black adolescent girls and women (Dietz, 2019). For Black adolescent daughters and mothers, the unique intersection of the lived experience of their race, racial discrimination, gender, culture, and environment in America can impact their health behaviors.

Including content that allows for expanded integration of these factors would strengthen the cultural adaptation of BGM and potentially bolster the impact of this obesity prevention intervention.

Strengths & Limitations

A strength of BGM is that it is one of very few interventions that report Black adolescent daughters and mothers working together in an obesity prevention intervention. Few studies incorporate mothers as active participants in obesity prevention interventions. There was high retention for those who participated in the study, and participants expressed high satisfaction. However, there were limitations.

Without a missed-visit protocol for session 1, daughters who could benefit from participation in BGM were not given an adequate opportunity to participate in the intervention. Given the small sample size, broad interpretations cannot be made of the data and thus limit the generalizability of the study findings. However, the purpose of the study was to assess feasibility of the intervention. The outcome measures of dietary data were self-administered using paper-pen assessments. Both daughters and mothers had invalid self-reported dietary data at the Week 12 assessment, with some daughters having invalid self-reported physical activity data as well. Using an electronic version of assessments should be explored to immediately identifying missing data (Tabacchi et al., 2014).

Conclusion

It is important to integrate the unique intersection of race, gender, culture, and environment to this culturally tailored obesity prevention intervention for Black daughter–mother dyads. Excellent attendance, retention, and satisfaction among those who participated in the study suggests that we succeeded in conveying the importance of healthy physical activity and dietary behavior change. This lifestyle intervention would be strengthened by modifications to recruitment and retention as well as incorporation of a computerized dietary assessment tool, a tailored dietary app for self-monitoring, and increased photo-based and group homework activities.

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Table 1. Black Girls Move Session Content

Black Girls Move group meeting strategies based on social cognitive and family systems theory					
	Social cognitive Theory (SCT)		**Family Systems Theory**	**Homework**	**Target Outcomes**
	Construct: Vicarious experience	**Construct:** Behavioral rehearsal	**Constructs:** Problem solving, communication, roles		
Session. Topic	**Strategies:** video, discussion	**Strategy:** group activity	**Strategies:** scenarios, discussion		
1PA. Let's Get Started	Introduction to Fitbit	Track your steps walk 10 minutes	Identifying strategies to put PA into daily life	Meet personal weekly step goal	PA: set step goals Communication: providing support
1N. Let's Get Real: Nutrition	My Plate	Make taco bowl using foods from each food group	Navigating unhealthy food choices in the family	Take and text one photo of meal for discussion	N: reducing sugar-sweetened beverages Communication: food choices
2PA. Let's Get Real: Exercise	Benefits of Physical Activity	Practice along with video workout Instant Recess	Sharing benefits of physical activity	Complete Instant Recess at home @ least 3 times per week	PA: monitor steps Communication: sharing benefits
2N. Exploring Food Labels & Portion Sizes	Food labels	Practice comparing food labels	Sharing food labels in making good choices	Compare labels to meet your healthy eating goal	N: Monitor portion sizes Communication: reading labels
3PA. Overcoming Personal Barriers	Personal barriers meeting PA & dietary goal	Practice post workout breathing techniques	Personal barriers and soliciting support	Identify and use one personal barrier technique	PA: monitor steps Communication: solve personal barrier
3N.What's for Breakfast?	Accessible on the go breakfast and dinner options	Make on-the-go breakfast	Introducing new meals at home	Take picture of grocery receipt then write two healthier substitutions	N: making quick meals Communication: choosing a healthy breakfast
4PA.Overcoming Environmental Barriers	Environmental barriers to meeting PA & dietary goal	Web-based supports for locating healthy food & safe PA	Environmental barriers	Identify and use one environmental barrier technique	PA: monitor steps Communication: locate safe walking area
4N. Snacking	Accessible on-the-go snack options	Make a healthy snack	Providing support for eating healthy snacks	Prepare healthy snacks to meet your healthy eating goals	N: choose a healthy snacks Communication: making snack
5PA. Let's Do It	Identify high-risk situations for PA & dietary relapse	Practice strategies to prevent relapse	Seeking support following PA & diet relapse	Meet personal weekly step goals	PA: monitor steps Communication: provide support
5N. Portion Sizes	Ways to determine healthy portion sizes	Make snack emphasizing use measuring cups	Selecting portion sizes nonjudgmentally	Prepare healthy snacks to meet your healthy eating goals	N: choose a healthy snack Communication: trying new portion sizes
6PA. PA Putting it all Together	Reviewing PA achievements, plans for maintenance	Incorporating planned physical activity	Negotiating roles and making plans for PA maintenance	Share your favorite PA technique	PA: set maintenance goal Communication: negotiating a maintenance plan
6N. Nutrition Putting it all Together	Reviewing diet achievements, plans for maintenance	Making a grocery list and 3 day meal plan	Negotiating roles and making plans for diet maintenance	Bring & share your favorite recipe	N: set maintenance goal Communication: negotiating a maintenance plan

Note. PA= Physical Activity; N= Nutrition