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Process evaluation of a culturally-tailored physical activity intervention in African-American mother-daughter dyads

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ABSTRACT

The purpose of this study was to describe process evaluation data including intervention fidelity, dosage, quality, participant responsiveness, and program reach for the Mothers And dauGhters daNcing togEther Trial (MAGNET) in Springfield, MA, in Spring 2013 and 2014. Seventy-six mother-daughter dyads were randomized to the mother-daughter group (CH-M, n = 28), the child-only group (CH, n = 25), or the health education group (CON, n = 23). CH-M consisted of 60 min of moderate-to-vigorous culturally-tailored dance classes for dyads. CH consisted of dance classes for the child. All groups received homework tutoring and weekly health newsletters. Process evaluation data were assessed at each intervention session (three days/week, 6-months) with semi-structured questionnaires by researchers. CH dance classes were slightly longer (58.2 ± 3.5 min) than CH-M (54.4 ± 5.5 min). In both groups, participants spent the majority of the dance intervention in light intensity physical activity (PA). Participants in the CH-M group enjoyed participating in MAGNET > 90% of the time. Mothers (92%) indicated that they wanted to continue dance as a form of PA. Mothers expressed that transportation, time commitment, and assessments were barriers to participation. Participants suggested future interventions should include longer intervention length and more communications between research staff and mothers. The MAGNET intervention matched the originally intended program in most aspects. A lower intervention dose was delivered to the CH-M group potentially due to barriers described by mothers. Because mother-daughter interventions have shown minimal effects on increasing PA, it is imperative that researchers utilize process evaluation data to shape future studies.

1. Introduction

Current recommendations suggest that children (ages 6–17 years) engage in at least 60 min of daily moderate to vigorous physical activity (MVPA) (US Department of Health and Human Services, 2008). However, these guidelines are not being met by most children as only 35% of 6–11 year-old children are attaining the recommended daily amount of physical activity (PA) (Troiano et al., 2008). Additionally, African-American girls are more likely to report not meeting PA guidelines during the week compared to their Caucasian and Hispanic counterparts (Eaton et al., 2012). Because African-American girls are not meeting PA guidelines (Eaton et al., 2012), effective interventions are needed to increase time spent in MVPA in this population. Several PA interventions have been conducted in a variety of settings (e.g., in-school, after-school, home-based) in an attempt to increase PA in minority children, but have reported minimal changes (Brown and Summerbell, 2009; Trost et al., 2011).

In pre-adolescent minority children, research has suggested that for a PA intervention to be effective, it must include enjoyable activities and incorporate the family, specifically the mother (Kumanyika and Grier, 2006). Currently, very few studies have examined the impact of parent-child PA interventions on the PA levels of children and have reported mixed results (Brown et al., 2016; van Sluijs et al., 2011). Additionally, family-based interventions specifically in African-American girls have shown equivocal results, with no clear strategies for parent involvement to aid in intervention success (Barr-Anderson et al., 2013). Although there is low quantity of culturally-tailored mother-daughter PA interventions, the reported mixed results could be due to the implementation of these interventions or other process evaluation issues (i.e., study fidelity). Intervention success or failure can be attributed to the degree of which the intervention was delivered as originally planned and the effectiveness of the intervention implementation procedure (Durlak and DuPre, 2008). Typically, studies will report one or two components of process evaluation data (e.g., participant attendance), but few have comprehensively reported all process evaluation measures. Without an understanding of intervention

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implementation, it is difficult to understand exactly what program was delivered and properly interpret study outcomes (Durlak and DuPre, 2008). Therefore, it is important to assess and understand how these factors (i.e., intervention implementation) contribute to study outcomes. Unfortunately, there is limited data describing the process evaluation of African-American parent-child interventions. Therefore, the purpose of this paper is to describe the study process evaluation data (intervention fidelity, dosage, quality, participant responsiveness, and program reach) of the Mothers And dauGhters daNcing togEther Trial (MAGNET). MAGNET was designed to examine the effects of a 12-week mother-daughter afterschool culturally-tailored dance intervention on the PA levels of African-American pre-adolescent girls.

2. Methods

Participants were recruited via flyers, radio announcements, and face-to-face recruitment in the Springfield, MA, area. In Springfield, 59.5% of individuals completed high school or less, 70.8% have a household income less than $50,000, and 18.3% of children live in single-parent families (US Census Bureau, 2013). Daughters were eligible to participate if they were between 7 and 10 years old, identified as African-American or Black, and had a maternal figure willing to participate. Participants were excluded if they had any condition limiting their ability to participate in PA or assessment measures, or could not complete the informed consent in English. Additionally, daughters were excluded if they had any medical condition affecting growth or took medications affecting growth. Mother-daughter dyads (n = 76) were randomized to one of three intervention groups: mother-daughter dance (CH-M, n = 28), daughter only dance (CH, n = 25), or a health education group (CON, n = 23). The total sample was divided among two cohorts (cohort 1 = Spring 2013; cohort 2 = Spring 2014). Each cohort consisted of all three groups. Dyads in the CH-M group attended dance classes designed to elicit MVPA for 60 min, three days/week. Daughters in the CH group attended dance classes alone, while their mother participated in the health education program. MAGNET was culturally-tailored with both the surface (dance styles and music, African American instructor) and deep structure (historical influences, importance of maternal figure, collectivism) influences (Resnicow et al., 1999). CH-M and CH daughters received cultural lessons once per week for 15 min (e.g. African-American women in history spotlight, cultural ties to dance). Dyads in the CON group participated in the health education program consisting of weekly lessons and newsletters sent home. All interventions were implemented three days/week for 12 weeks. Participants also received a healthy snack and homework tutoring (60 min) as part of the program. All procedures were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. All study protocols were approved by the University of Massachusetts Amherst Institutional Review Board. To participate in this study, mothers provided written informed consent for both themselves and their daughter, and daughters provided written assent.

The intervention design was based on the social cognitive theory (SCT), which suggests that behavior is learned, in part, through modeling and observation of peers and role models (i.e., mother) (Bandura, 1998; Bandura, 1986). These learned behaviors are altered and maintained through the interplay of personal factors (i.e., self-efficacy, outcome expectation), behavioral factors (i.e., skills needed, competence), and environmental factors (i.e., inclusion of mother, cues). Intervention components were determined from formative research focus groups (Alhassan et al., 2014). Results from these focus groups indicated that African, Hip-Hop, and Jazz were the preferred dance styles and that they valued a dance instructor with whom they could identify with. Therefore, an experienced African-American dance instructor was hired to lead the dance classes.

Participants' height and weight were measured using standard procedures at baseline, midpoint (6-weeks), and post-intervention (12-weeks). From these data, mothers' BMI and daughters' BMI percentile were calculated. Physical activity was assessed using an Actigraph accelerometer (GT1M/GT3X, Actigraph LLC, Pensacola, FL) for seven consecutive days at baseline, midpoint, and post-intervention. The accelerometer was worn during all waking hours on an elastic belt around the waist and placed on the right hip of both mothers and daughters. Data collectors were trained prior to the beginning of intervention implementation to observe intervention sessions and accurately record fidelity and process evaluation information. Data was collected via a semi-structured questionnaire that was developed specifically for this study. During each intervention session, a trained data collector sat in the back of the room, observed the session, and recorded data without interacting with participants. Overall, study process evaluation was assessed every day of the 12-week intervention. However, intervention (culturally-tailored dance session) intensity was assessed one randomly selected day per week using Actigraph accelerometers. Process evaluation measures were guided by Durlak and Dupre's manuscript and included intervention fidelity (i.e. adherence, compliance, integrity), dosage (i.e. quantity), quality (i.e. correct delivery), participant responsiveness (i.e. interest, attentiveness), program reach (i.e. participation rates), and adaptation (i.e. program modification) (Durlak and DuPre, 2008). Additionally, mothers' perception (i.e., barriers to intervention participation, favorite and least favorite intervention components) and satisfaction (i.e., with research staff and dance instructor) of the program were assessed at the completion of the program using an open-ended survey. Means and standard deviations were calculated for continuous variables and frequency distributions and exemplary quotes were utilized for categorical (i.e., qualitative) variables.

3. Results

Participants in the MAGNET intervention included 76 mother-daughter dyads. A large percentage of study participants came from single-parent households (61.6%) with an annual income < $39,000 (62.8%) (Table 1). Intervention dance classes lasted 58.2 ± 3.5 min and 54.4 ± 5.5 min for the CH and CH-M groups, respectively. To assess fidelity, adherence to the intervention dance classes was measured using Actigraph GT3X accelerometers. Participants spent the majority of the time in dance class in light intensity activity. During the CH dance classes, daughters spent an average of 6.4 ± 8.7 min in sedentary behavior, 41.1 ± 9.3 min in light intensity activity, and 11.1 ± 8.5 min in MVPA. During the CH-M dance classes, daughters spent an average of 9.1 ± 12.9 min in sedentary behavior, 34.1 ± 12.0 min in light intensity activity, and 10.8 ± 8.8 min in MVPA. These data indicate that daughters in the CH dance class spent less time being sedentary and more time in light intensity and MVPA compared to the daughters in the CH-M group.

Across both study cohorts, 64 of 72 (88.9%) possible intervention days were implemented. Eight total intervention sessions were cancelled (cohort 1, n = 5; cohort 2, n = 3) due to inclement weather. Each session was designed to incorporate African-American cultural

Table 1
Baseline characteristics of MAGNET participants.

	Mothers	Daughters
Age (years)	37.4 ± 7.7	8.3 ± 1.3
BMI (kg/m^2)	31.9 ± 7.2	–
BMI percentile	–	68.2 ± 29.1
TD sedentary time (%)	71.2 ± 7.0	60.2 ± 10.0
TD light PA (%)	27.2 ± 6.3	36.8 ± 8.9
TD MVPA (%)	1.6 ± 1.1	2.9 ± 2.0

All values are presented as mean ± sd. BMI = body mass index; TD = total day; PA = physical activity; MVPA = moderate-to-vigorous physical activity. Wear time for mothers and daughters were 5.1 days and 5.4 days, respectively.

Table 2
Structured questionnaire responses collected by research staff observing the intervention.

Fidelity question (% responding "yes" for each question)	CH (%)	CH-M (%)
During the dance intervention, were at least 50% of the girls participating in the dance lessons?	95.3	100.0
During the dance intervention, did at least 50% of the girls seem to be having fun?	96.9	95.3
During the dance intervention, were at least 50% of the mothers participating in the dance lessons?	n/a	95.3
During the dance intervention, did at least 50% of the mothers seem to be having fun?	n/a	90.6
Was there an African American cultural heritage concept integrated into the dance class?	57.8	60.9
Did the dance instructor follow the dance routine developed?	95.3	98.4
Did the dance instructor use the required music?	100.0	100.0
Was the dance instructor an African American female?	96.9	96.9
Did the dance instructor encourage the participants to participate?	96.9	100.0
Were mothers and daughters encouraged to dance together?	n/a	70.3
Of the entire dance class, did participants spend at least 50% of the time simply standing and watching the dance instructor versus dancing?	4.7	10.9

CH = child-only group; CH-M = mother-daughter group.

heritage concepts. This occurred 57.8% of the time in the CH group and 60.9% of the time in the CH-M group. Finally, 100% of health-related topic newsletters (n = 24) from both cohorts were sent out to the participants. Based on data collected by trained researchers while observing the intervention, MAGNET was delivered clearly and correctly with the exception of the cultural lesson integration (Table 2). In both the CH and CH-M dance classes, the dance instructor delivered the intervention as intended by following the developed dance routines, using the required music, and encouraging the participants to be engaged in the lesson over 95% of the time. Additionally, participants spent more time standing and watching as opposed to dancing in only 4.7% of CH classes and 10.9% of CH-M classes. However, dyads were encouraged to dance together only 70.3% of the time.

Participant responsiveness was assessed by measuring reported enjoyment. Both mothers and daughters seemed to enjoy the MAGNET program (Table 2). During the dance sessions, at least 50% of the daughters and mothers actively participated and seemed to be having fun over 90% of the time in both groups. With respect to program reach, participation rates were low. During the CH dance classes, an average of 6.2 ± 2.9 daughters attended. During the CH-M dance classes, 7.0 ± 2.0 daughters and 5.1 ± 2.6 mothers attended. These data indicate that mothers attended fewer intervention days than daughters suggesting that the intended mother-daughter component was not met.

Data from the end of the program survey completed by mothers indicated an overall level of satisfaction with the program, staff, and instruction provided (Table 3). The majority of participants (92.3%) stated that they were likely to continue dancing as a form of PA in the future. One mother stated, "*It doesn't feel like you're working out. Even if it's a bad day, when the music starts you just have to move*!" Mothers listed homework help, fun dance classes, and increased time spent with their daughters as reasons why they were satisfied with the MAGNET intervention. Mothers indicated that intervention staff offered the program at a convenient location (local elementary school) and were great with the children, patient, and full of energy. With respect to dance style, 38.5% of mothers preferred Hip-Hop, 26.9% preferred African, 15.4% preferred Jazz, and 19.2% liked them all or had no preference. One mother stated, "*I love to learn more about my heritage, specifically in music and dance*," while another said "*Hip-Hop was more of a workout and the choreography was very good*." Additionally, 88.4% were satisfied or very satisfied with the level of instruction provided by the dance instructor. One mother stated, "*She made us all feel important, and that we could learn the dances*."

Table 3
End of program survey responses for the MAGNET intervention.

End of program survey questions (%)	1	2	3	4	5	n/a
How satisfied are you with the UMass MAGNET Program?	0	0	3.8	30.8	65.4	0
How satisfied are you with the level of facilitation provided by the UMass Pediatric Physical Activity Lab Staff?	0	0	3.8	19.2	76.9	0
How likely are you to participate in dancing for physical activity in the future?	3.8	0	3.8	30.8	61.5	0
How satisfied are you with the level of instruction provided by the dance instructor?	0	0	0	19.2	69.2	11.5

Higher scores indicate greater levels of satisfaction, while lower numbers indicate greater levels of dissatisfaction.

Mothers were also asked about barriers to their participation in this and other PA programs. The most common barrier was transportation, as many participants did not have their own car or had to work during the intervention time and had difficulty relying on others to get their daughter to the intervention site. The time commitment was also a barrier for mothers, as many attended the intervention right after work, which created long days and less time for their usual activities. Mothers saw the assessment component of the intervention as a barrier. Several mothers commented that the questionnaires were long and they disliked wearing the PA monitors as it was hard to remember to put on in the morning.

Finally, mothers were asked to provide suggestions for future intervention programming. Common themes included longer intervention length, options to continue the program after the study ended, healthier food options provided on showcase nights with recipes to take home, and more communication via a weekly mothers' meeting group. One mother concluded about the program, "*The program was encouraging and provided an environment to bond with my daughter*."

4. Discussion

African-American girls suffer disproportionately from overweight and obesity potentially due to lack of meeting current PA guidelines. Intervention efforts have been made, yet most show minimal results (Barr-Anderson et al., 2013; Reed et al., 2015). Recent reviews have indicated the need for more evidence to support effective approaches to designing and implementing PA interventions in minority children (Barr-Anderson et al., 2013; Kitzman-Ulrich et al., 2010). It has been suggested that effective interventions in this population must be fun, culturally-tailored, and inclusive of the family (especially the mother). However, very few intervention studies have published papers specifically describing intervention implementation and the several components that encompass process evaluation. Therefore, the purpose of this study was to describe the process evaluation data from a culturally-tailored PA intervention (MAGNET) in pre-adolescent African-American girls with the goal of informing future intervention design in this population.

With respect to intervention fidelity, the delivered version of MAGNET matched the originally intended program in most aspects. The CH-M dance class was approximately 54 min in length, which was 4 min shorter than the CH group dance class and shorter than the originally intended duration of 60 min. Our previous focus group data

indicated that mother's preferred dance classes in which they were participating to begin no earlier than 5:30 pm (Alhassan et al., 2014). This time choice would allow them time to get to the intervention site (which was centrally located) after work. Despite the present intervention's efforts to increase mother attendance by starting at this time, the shorter CH-M class duration was often due to participants (mothers) arriving late. Additionally, daughters in the CH-M group were more sedentary and spent less total minutes in light or MVPA during the dance class compared to the CH group. This could potentially be due to teaching a larger group, regaining the focus of the daughters once their mothers arrived, and the need to re-teach the same steps to the late arrivals. It is possible that the CH-M dance class was different than the CH dance class because the instructor was tasked with making sure both the mothers and daughters were learning the dance steps.

Finally, 89% of dance classes were implemented. This rate was slightly lower than that of the Stanford GEMS pilot study, which implemented 97% of the dance classes (Robinson et al., 2003). Dance class implementation was mainly limited by inclement weather (i.e., snow/ice) and this tended to happen in the early stages of the intervention due to it beginning in the winter. However, only 60% of the cultural lessons were integrated into the intervention. Cultural lesson integration was much lower than anticipated. This was often due to the need to extend homework tutoring time and dealing with behavioral issues among the girls. While 100% of the health education newsletters were sent out, MAGNET did not include a measure of how often they were read by either mothers or daughters. Robinson et al. was able to conclude that 87% of daughters and 80% of parents read the information newsletters associated with their intervention (Robinson et al., 2010).

Intervention quality goals were met, which was indicated by a high percentage of positive responses to questions on the research staff member's semi-structured questionnaire. However, one alarming conclusion specified that mothers and daughters were only encouraged to dance together 70% of the time. It is important for the instructor to encourage mother-daughter participation in every session as we hypothesized that encouragement would motivate the dyad to practice their dance together at home in an attempt to integrate PA into their lives outside of the intervention. This highlights the need to further enhance the mother-daughter component of the intervention to encourage them to participate together and carry those behaviors with them after the intervention has ended. Generally, both mothers and daughters enjoyed participating in the MAGNET program, which is consistent with other dance interventions in this population (Robinson et al., 2003; Robinson et al., 2010; Story et al., 2003; Beech et al., 2003). For example, in both Stanford GEMS and Memphis GEMS, approximately 92% and 96% of the girls, respectively, were satisfied with the program (Robinson et al., 2003; Beech et al., 2003). Participants seemed to respond well to a culturally-tailored intervention program, which is consistent with what was valued in the formative focus group study (Alhassan et al., 2014). The dance styles chosen elicited satisfaction among the participants and were consistent with previous dance styles chosen in mother-daughter dance interventions for preadolescent African-American girls (Robinson et al., 2003; Robinson et al., 2010). For example, Stanford GEMS also utilized the African and Hip-Hop dance styles to elicit MVPA and serve as a connection to the African-American culture (Robinson et al., 2010).

A lower dose of PA was delivered than initially intended due to low attendance rates. While attendance raters were lower than anticipated, they were similar to the Stanford GEMS trial where participants attended one day per week on average with transportation complications (Robinson et al., 2010) and the Stanford GEMS pilot study where approximately half of the participants attended two days/week without transportation provided (Robinson et al., 2003). Like these two studies, one of the major barriers to attending the present intervention was transportation to the intervention site. In addition to low overall attendance rates, CH-M mothers attended fewer intervention sessions than their daughters. Again, this highlights the need to develop a stronger mother-daughter component to create an environment that fosters mother and daughter involvement.

Overall, mothers expressed satisfaction with the intervention program and the instruction provided during the dance class. Components of most importance to mothers included homework help for their daughters, a fun culturally-tailored program, a convenient location, and increased time spent with their daughter, all of which were cited as essential components in the previous formative focus group study (Alhassan et al., 2014). This emphasizes the importance of conducting this type of research and designing programs with community members' goals in mind. Finally, mothers reported that they did not enjoy the assessment portion of the study. Our findings are similar to what others have reported. For example, in a recent PA intervention study in a similar age group of women by Adams et al. (2013), 11 of 31 participants dropped out of the study because of burdensome activity tracking (i.e., dislike wearing a pedometer). While assessment is a necessary part of any research study, it is important for researchers to understand the burden of some measurements and find ways to minimize time spent completing them.

Strengths of this study include direct observation of all intervention sessions by trained research staff, objective analysis of intervention adherence with accelerometers, and compiling critical data to inform future intervention efforts. However, this study is not without limitations. We only collected mothers' input about the intervention after the program had ended. It is possible that asking these questions and receiving feedback earlier in the program (i.e., midpoint) would have allowed the research staff to make necessary changes and improvements to the program. It is also important to note that the researchers collecting process evaluation data were unable to be blinded to the different conditions. Thus, there may have been bias in these observations. Another limitation is the use of the waist-worn accelerometer, as its placement limited our ability to capture upper body movements that made up a large part of the dance routines. This could have led to inaccurate measures of intervention adherence and intensity. Despite these limitations, the benefits of collecting this type of data and assessing the implications for future intervention research are imperative to the success of behavior change interventions.

5. Conclusion

Overall, both mothers and daughters enjoyed participating in the MAGNET intervention program. Mothers expressed an interest in continuing dance as a form of PA with their daughters. For future interventions, mothers suggested a longer program duration (> 12 weeks), more hands-on activities with their daughters about how to live a healthy lifestyle, and options to continue being active once the intervention ends. These suggestions are critical to future intervention studies in this population to bolster lasting intervention effects. It is imperative that researchers consider process evaluation data prior to designing new interventions to potentially improve intervention effects. Data from formative focus groups as well as pilot study process evaluation data will be utilized to help shape the design of future interventions. Data from this study is not generalizable to other African American mothers and daughters due to the small sample size, and representativeness of this sample relative to other local and national populations. However, this process evaluation (procedure and assessment) is generalizable to other African-American mother-daughter dyads. Additionally, in scaling this program up, it is important to understand regional cultural differences and the needs of the community through preliminary research. Currently, mother-daughter interventions have shown minimal effects in increasing PA levels. In order to prevent future interventions from making similar mistakes, it is urgent that researchers publish process evaluation data so that others can learn what strategies can be considered best practices.

Conflicts of interest

Alhassan was supported by an NIH K award. Authors have no conflict of interest to report. Study sponsor did not have any role in the study design, collection, analysis, and interpretation of the data, writing the manuscript; and the decision to submit the paper for publication.

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