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Feasibility and Acceptability of an Internet-Based, African Dance-Modified Yoga Program for African-American Women with or at Risk for Metabolic Syndrome

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Abstract

African-American (AA) women are the segment of the population that experiences the highest mortality from metabolic syndrome (MetS). Yoga decreases risk of MetS, yet there have been no yoga studies of AA women with or at risk for MetS. The purpose of this 4-week study was to test the feasibility and acceptability of a culturally tailored, Internet-based intervention, yogic dance (YD), using digital videos in a sample of AA women (ages 35-64) at risk for or with MetS. The investigators examined the rates of accrual, attrition, and reasons for attrition; the feasibility of using the Internet to deliver the intervention; the acceptability of the intervention as structured; and any other benefits and/or limitations of YD. The study used a single-group, mixed-methods design underpinned by social constructivist theory and Pender's Health Promotion Model. Twenty-four women provided consent to enroll in the study. After completing in-person semi-structured interviews and Internet-based measures, including the Physical Activity Readiness Questionnaire, and the modified International Physical Activity Questionnaire, consented participants engaged in 4-weeks of the yogic dance intervention via daily video-based instructions located on the study Web site. After the intervention, four women participated in focus groups to voice their perceptions of barriers to and benefits from YD and the acceptability of using the YD intervention. The investigators analyzed focus group data using content/thematic analysis and validated themes with baseline semi-structured interviews. The majority of the women (79%) found YD acceptable. Themes that emerged from the descriptive data include: (1) Culture is an important aspect of yogic dance; and (2) Increased social support would enhance yogic dance participation. The integrated results from this feasibility study will inform research exploring the complex correlates that influence health behaviors in AA women.

Keywords

African-American; Women; Yoga; Physical activity; Cardiovascular disease; Metabolic syndrome

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Introduction

African-American (AA) women are the segment of the population that experiences the highest mortality from chronic diseases resulting from the metabolic syndrome (MetS) [1,2]. MetS is a complex disorder defined by interrelated risk factors, including dysregulated blood lipids (dyslipidemia); high blood pressure (hypertension); insulin resistance; high waist circumference and body fat percentage (abdominal obesity); high body mass index (obesity); chronic stress; and sedentary lifestyle [3,4]. MetS contributes significantly to the progression towards obesity, type-2-diabetes (T2D) and atherosclerosis/cardiovascular disease (CVD), chronic conditions that create a significant burden on the nation's health care system [1,5,6]. AA women experience higher age-adjusted blood pressure and obesity rates than all other ethnicities [7,8]. Modest weight reductions can have a beneficial effect on hypertension management, [9] and increased physical activity has been positively associated with a reduced risk of developing T2D and CVD [1,10]. Increased physical activity for a minimum of 30 minutes each day, with an acceptable option of accumulating three 10-minute sessions toward the 30-minute daily minimum 5 days each week, has been associated with lowered risk of CVD mortality [6]. AAs are less likely to participate in physical activity when compared to Whites, regardless of income, education, age, sex, BMI, or presence of a chronic condition (i.e., T2D, CVD) [2]. When compared to exercise, which refers to planned, structured, and repetitive physical activity, leisure time or low-level physical activity is an appropriate entry level for sedentary individuals, as incremental behavior changes positively influence the maintenance of physical activity [11].

Yoga as Low-level Physical Activity

In terms of metabolic expenditure, yoga practice is considered a low-level physical activity [12]. Yoga can improve metabolic rate, perfusion, cardiopulmonary function, and exercise capacity [13]. Yoga is useful in managing symptoms of MetS [14] and can bring about improvements in lipid profiles, [15] and blood pressure [13]. Yoga improves insulin sensitivity and is generally effective in reducing the risk of T2D [15]. Yoga practice is protective against heart failure [16] and atrial fibrillation, [17] the cardiovascular events suffered most frequently by AA women [8]. These cardiac events also create the largest cost burden to the current health care system [1].

Yoga is thought to work by accessing parasympathetic pathways in the autonomic nervous system and stimulating the relaxation response [18]. Neuro-hormonal pathways, such as the renin angiotensin aldosterone system, are thought to be important in the control of elevated heart rate, elevated blood pressure, myocardial infarction, atrial fibrillation, and congestive heart failure [19-21]. These same neuro-hormonal pathways also are thought to be important in the mechanisms of yoga [18]. Because of its effect on multiple mechanisms in autonomic pathways, yoga has positive effects on reports of stress [19] and heart rate variability, a stress indicator [22]. Yoga practice attenuates psychological symptoms, promotes health, and can be an efficacious self-care practice in the prevention and maintenance of cardiac and metabolic wellness [19]. AA women generally underutilize yoga, [23] primarily preferring prayer [24,25] and herbal supplements [26-28] as complementary health approaches. The

use of yoga in AA women, specifically, has been understudied, with only two identified studies [16,29] evaluating yoga in AA individuals with CVD. At the time of this report, there were no studies evaluating the impact of yoga on AA women with or at risk for MetS indicating a need to further explore yoga in this high-risk population.

Cultural Dance as Leisure Time Physical Activity

Cultural dance has been empirically studied in AA women and has demonstrated potential for improving MetS-related symptoms. Cultural dance improved BMI, body fat, and walk/run time in AA mothers of adolescents; [30] body fat and blood pressures in AA women with T2D; [31] and functional capacity and lifestyle physical activity in church-attending AA women; [32,33]. In a study that compared the health benefits of practicing African dance to those produced by hatha yoga practice, African dance increased the participants' positive affect scores and reduced their perceived stress scores on a level similar to that of yoga [34]. Drawing from traditions originating in West African societies, [35] cultural dance has been incorporated into modern AA culture and is seen in daily life, family gatherings, religious meetings, and educational and work-related tasks. Cultural dance also has unique qualities, such as emphasis on culture, family/community, communication, and spirituality, important factors associated with health-promoting behaviors in AA women [24,36]. To the investigators of this study, the aforementioned qualities made dance desirable as a template upon which to integrate the beneficial properties of yoga.

The purpose of the current study is to examine the feasibility and acceptability of a novel, Internet-based, cultural dance-modified yoga intervention tailored for AA women—referred to as yogic dance. African dance, with its rich symbolism and meanings, was chosen to enhance the intervention used in this research study because it offers an opportunity for AA women to have a culturally sensitive means of increasing their leisure-time physical activity in a way that is stress-reducing and enjoyable. With the input of an interdisciplinary team consisting of physical activity researchers, expert yoga practitioners, and cultural dance choreographers, the investigators developed and tested the feasibility of an innovative yoga-based intervention infused with symbolism, meaning, and movements drawn from principles of West African cultural dance to promote physical activity behaviors in the targeted population.

Materials and Methods

Under the theoretical assumptions that people act to achieve reachable goals with valuable outcomes and that to change one's behavior one has to change the way s/he thinks about the behavior, the investigators used the Health Promotion Model (HPM) [37] (Figure 1). Pender developed the HPM to assist the nurse investigator/interventionist in working collaboratively with the community-based client to achieve health promoting lifestyle behaviors [38]. The HPM is a trans-theoretical model that combines concepts from multiple theories to facilitate nurses' understanding of the background factors that influence health-promoting behaviors. The investigators adapted HPM constructs, prior related behaviors, personal factors-self perceptions, benefits of and barriers to health-promoting behavior,

interpersonal influences-models, situational influences-culture, and commitment to a plan of action/goal-setting to form the theoretical underpinning for the yogic dance feasibility study. These foundational constructs were incorporated into the intervention at multiple focal points, including the pre-intervention phase when the investigators held preliminary interviews to establish the prior-related physical activity behaviors of participants and self-perceptions associated with their obesity. Additionally, at the conclusion of the intervention, the investigators hosted focus groups to explore the facilitators and barriers to consistent yogic dance practice.

The intervention was proposed to be a feasible means for increasing participation in yoga-based physical activity, which the investigators further proposed would, in future studies of longer duration, lead to direct and indirect effects on improving modifiable MetS characteristics such as body mass index (BMI), [39-42] blood pressure, [42] waist circumference, [39,43] and sedentary lifestyle. Supported by social constructivist theory [44] wherein meanings from human beings are derived as they engage with the world they interpret, responses from focus groups and semi-structured one-on-one interviews were integrated to elicit a meaningful description of what it was like to participate in the yogic dance study.

Study Design

A single group, mixed-methods approach combining quantitative and qualitative research methods, was used to elicit corroboration and convergence of multiple forms of data to explore the complex determinants of yoga- and dance-based physical activity in AA women. Focus group data provided contextual understanding of the relationships among HPM theoretical constructs [45] such as the influence of facilitators and barriers on setting a definitive goal to increase yogic dance activities to 5 times per week. The Internet was chosen as the format for this video intervention because of the potential for its high accessibility and ease-of-use. The digital divide [46] among this population is not as wide as once thought. In terms of wireless access, 64% of AAs, 75% of women, 79% of U.S. adults ages 30-49, and 71% of U.S. adults between the ages of 50-64 use the Internet regularly.

Because this was a feasibility study, a power analysis was not conducted. A convenience sample of 28 women was targeted for enrollment with a 40% expected attrition rate. This attrition rate, though higher than what is typically seen in physical activity studies involving White participants, is consistent with rates noted in physical activity studies including AA participants, [47] of which attrition is a significant problem with many studies reporting over 20% attrition and some studies with as high as 41% attrition. The current study took this into consideration and incorporated the anticipated 'loss-to-follow-up' into the study design and recruitment.

Setting/Recruitment of sample

The investigators obtained ethics board approval of the study methods and procedures from the University of Virginia Institutional Review Board (IRB). Forty-nine women (49) expressed interest in participating in the study based upon printed IRB-approved recruitment flyers and Craigslist™ advertisements. Interested women responded by email and social

media private inbox messaging and were prescreened by telephone for eligibility (Figure 2). The Physical Activity Readiness Questionnaire-Questionnaire-PAR-Q [48] was used to identify adults for whom physical activity may not be appropriate or for whom a physician's approval should be obtained before proceeding further with physical activity. Provisional inclusion criteria, or conditions for which a physician's clearance would be needed prior to study enrollment, were used to further protect the women from risk of harm. Twenty-eight (28) women were enrolled into the 4-week study. At varying times during the intervention, 4 women dropped out of the study citing overly busy lives (n = 2), personal illness (n=1), and family member's illness (n=1) as reasons for non-participation. Twenty-four (24) women completed the study.

Intervention

The yogic dance postures were developed using concepts from hatha yoga, [49] and the chakra system [50]. The chakra concept uses multiple imageries, including wheels, vortices, and/or beaded chains to describe the centers of life force that exist within humans; forces that, when stimulated, bring vital, life-restoring energy to the individual manipulating or aligning the chakras [50]. The chakra-aligning positions selected for the current study were intended to ground and center, increase personal power, and promote cardiovascular health in the study participants. Chakra-aligning yogic postures were integrated with movements from the West African dance lexicon [51,52] wherein body positions that maintain a low center of gravity (e.g., squats and lunges) combine with large gross upper body movements (e.g., wide sweeping arm circles and lateral reaching) to create balance and relieve tension within the practitioner [53,54]. Tenets from the KuKu dance, a woman's circle dance [55] arising from Guinea and Ivory Coast traditionally performed during community-based celebrations, were used to make the yogic dance warm-up and postures meaningful, culturally appropriate, and motivating for the participants.

Yoga- and dance-based postures were developed by the first author with the assistance of an AA certified yoga instructor with experience teaching yoga in West Africa; AA and West African dance choreographers; and an AA certified physical trainer with experience training women in the target population. The yogic dance poses/postures (Table 1) were named for the connection of the pose's imagery to nature and for references to strength and survivorship, key concepts in the life experiences of AA women [56-59]. Also incorporated into the development of yogic dance were nasal breathing cues, [49] African drumming patterns, [60] and principles from mindfulness, [61] a concept in which a person's awareness is focused in a non-judging manner on the present moment. The yogic dance videos were filmed using multiple AA models of varying sizes and activity/stretching levels to provide alternate role modeling of the postures and to demonstrate yogic dance practice at both beginner and more advanced levels.

The yogic dance videos were edited and subdivided into 7, 10-minute video training modules and uploaded to the yogic dance Web site. The modules populated an online video library of content with brief descriptors to inform the participant about what each module contains (Table 1). The Web site also contained a media gallery tab under which all yogic dance videos were catalogued; a menu containing all yogic dance study surveys/

questionnaires; an announcements area containing pertinent, chronological, study-related information; and an interactive syllabus that served as a portal to the Web site with hyperlinks to yogic dance Web site content.

A subset of women in the study ($n = 8$) participated in preliminary interviews exploring beliefs and attitudes toward yoga practice. The investigators used semi-structured and open-ended questions to explore the intrapersonal (self-perceptions) and interpersonal (models) constructs from the HPM [37]. All participants completed baseline demographic and anthropometric measures prior to engaging in 4 weeks of at-home yogic dance practice. The Individual Characteristics Form, developed by the first author, was used to record the baseline demographics, health status indicators, and prior PA-related experiences of the participants. Anthropometric measures (e.g., height, weight, BMI, and waist circumference) and cardiovascular fitness measures (e.g., blood pressure) collected during the eligibility phase were recorded on this form. The International Physical Activity Questionnaire (IPAQ), a 7-question survey of physical activity at moderate and vigorous levels, [62] was used to evaluate physical activity behaviors in the past 2 weeks and to determine whether or not the participant was considered sedentary prior to participating in the study. When compared to measures that assess continuous numbers indicating duration of physical activity in discrete amounts (e.g., 2, 30, or 50 minutes of physical activity), the IPAQ reports duration of activity in categories (e.g., 10-15, 16-30, or 31-40 minutes of activity). In the current study, the IPAQ was intended to determine nominal (yes/no) baseline sedentary status. The participants viewed Web site-based videos and completed Web site-based participation logs to document their yogic dance activities. Paper survey booklets and DVDs were used as a backup method in case of failure of online-based methods.

Before initiating the yogic dance videos, the Web site guided participants toward setting goals to increase their physical activity and to subsequently view and follow at least 3 10-minute yogic dance videos daily for at least 5 days per week during the 4-week study period. The Goal-Setting Worksheet/Contract contained questions assessing the participants' perceived benefits and barriers to physical activity and used the SMART goals protocol [63] to help the participants set realistic, achievable goals to increase yogic dance activities. The participants were directed to record their daily yogic dance participation using the Web site-based YD diary. The investigators used the YD diary to measure the time participating in yogic dance activity. Following the 4-week intervention, an Internet-based evaluation survey was used to collect data on the acceptability of the yogic dance intervention as structured. The evaluation included questions about specific components of the program, including the cultural aspects.

Feasibility of intervention

To determine feasibility of the intervention and the yogic dance study website, recruitment and retention rates were calculated from the (1) percentage of participants who completed the prescreening, eligibility, and enrollment phases of the study; (2) the percentage who completed all study measures; and (3) the percentage who preferred DVDs and printed study booklets over Web-based study materials. The investigators determined a priori the cutoff percentage (rates over 50%) by which the aforementioned rates would be deemed feasible.

In post-intervention evaluation, the investigators deemed Web site-based videos acceptable if a majority of the women (more than 50% of the respondents) favorably answered Likert-type scale questions about study components with the answers “agree” or “strongly agree.” Because of the unforeseen failure of the study Web site to adequately measure participants’ login times, and the reduced likelihood of detecting differences in physical activity in the short period of 4 weeks, the investigators chose not to objectively measure physical activity in this study. Any additional benefits and/or limitations of yogic dance were determined by qualitative analysis of the women’s responses to open-ended interview and focus group questions asked during and after the 4-week intervention.

Findings

Description of the sample

Twenty-four women completed the yogic dance study (Table 2). The mean age of the women in the sample was 43.4 years ($SD \pm 7.9$ years). In terms of socioeconomic status, all but one of the women were employed, half (50%) had an income of greater than \$40,000, and 83% of the women had health insurance coverage. All of the women in the study had in-home access to a computer and the Internet, and many (79%) had more than one Internet-accessible device (e.g., smart phone, tablet, laptop, and/or desktop). At baseline, 62.5% of the women were considered sedentary according to the modified IPAQ score. In terms of clinical characteristics (Table 3), 79% of the women belonged to the obese (BMI = 30-39) or extremely obese (BMI = 40-49) category. Twenty-two (92%) of the participants had waist circumferences ≥ 35 inches, which placed them at risk for MetS. Conversely, the mean systolic BP of the women was 122 ± 11.8 mmHg, with 58% of the women having a systolic BP < 130 mmHg. The respondents provided an oral report of their family histories of MetS symptoms. Most (83.3%, 75%, and 58%, respectively) of the women indicated primary (mother, father, brother, and sister) and secondary (aunt, uncle, cousin, and grandparent) family members’ histories of CVD, obesity, and T2D. After the 4-week intervention, a subgroup ($n=4$) of the 24 women who completed the study participated in two post-intervention audiotaped focus groups. Participants voiced their perceptions of barriers to and benefits from yogic dance, the experiences of yoga and dance in their daily lives, and the acceptability of using the intervention.

Feasibility of the yogic dance study

All (100%) the participants found the yogic dance intervention acceptable enough to complete some or all of the study components. Seventeen of the 24 participants who completed the study (71%) completed all of the study measures including those for feasibility and for individual biological and anthropometric characteristics. Corroborated themes from the focus group and survey data demonstrated that a majority (59%) of the women found the yoga-based postures to be doable; particularly for helping them to increase their energy levels and/or help they feel relaxed for bedtime. To varying degrees, participants found all seven yogic dance videos acceptable (Table 4).

Descriptive study findings

Integrated results from the qualitative portions of the study (i.e., focus group data, and one-on-one semi-structured interviews conducted with the participants prior to the beginning of the study) reveal two themes within the data: (1) Culture is an important aspect of yogic dance, and (2) Increased social support would enhance yogic dance participation. These themes were consistent across all the data sources.

Theme #1 -Culture is an important aspect of yogic dance—The yogic dance study took principles and symbology seen in West African cultural dance and combined these with postures of hatha yoga to create a version of yoga proposed to be more palatable and culturally sensitive to AA women. The two 10-minute videos containing the warm-up and stretching were infused with deep cultural elements such as African dance-inspired choreography and African drumming/timing cues.

When the women were asked what they enjoyed about the intervention, they spoke of the referential connections to African cultural heritage as being somewhat spiritual in its significance to them. One focus group participant had the following to say:

- I like when every time [the narrator] came on, [she] explained the culture of what you were doing in the dance, so that had the spiritual connection for me, like where it came from, where it was derived from, and a lot of it was over there in Africa, so that was the spiritual piece for me. ... I enjoyed learning the history of what I was doing.
- Another participant noted "...with the history piece, that made me feel prideful; it's just more of a connection, so I would say that was more spiritual for me."

Refining this theme using the write-in survey responses, one study participant described her positive experience with the cultural dance-inspired warm-up videos using the following words:

- "I really enjoyed the [African dance-based] warm-up and stretching videos the most! ... I plan on using the warm-up/stretching to begin a personal journey for myself."

The women echoed this sentiment throughout their responses. Seventy-five percent (75%) of the women reported enjoying the 10-minute African dance-based warm-up video. This moderate-intensity dance video taught the participants five symbol-rich, culturally derived dance moves in succession, ending with a mid-tempo choreographed flourish of low to moderate level physical activity. Two of the women who were mothers of young children believed the warm-up not only motivated them to move more but engaged other members of the family as well. One respondent said, "The warm-up and stretching were my favorite! My husband and little kids (ages 1-4) joined me at times when I did those [dance moves] during day hours." On this same topic, another mother shared, "Whenever I put the video in, my 4 year-old-did ... [the dance moves] with me. He loves music, so it was inviting and made him want to try it. He even tried the [yoga-style] posing and the stretching."

The intervention also included AA female models of varying BMIs and body compositions. The women in the study were overwhelmingly impressed by the inclusion of these deep structural concepts. From the theoretical underpinning for this research (HPM framework), sociocultural influences can include role modeling of the desired health behavior. Interview questions about the benefits of the yogic dance program yielded several favorable responses to the AA female video models, women whose sizes were larger than women typically seen in American exercise videos. The women used key terms, including “connection” and “good” to bring together this theme, supported with the following exemplar statement:

- But the little skinny White girls on the workout videos, I don’t have a connection to them, and ... just looking at their bodies and thinking, “you guys and me, there’s just no connection.” So, with the different body types in the [yogic dance] video that made me feel good.

Two participants reiterated the benefits of the cultural connection that participating in the yogic dance study brought them as they engaged in the following dialogue:

- Participant 1: Today I said to myself “Okay let me get this task [participating in the YD focus group] off my list.” I wasn’t necessarily excited about it, but ... once I get here and the conversation [begins], I think to myself “If I would have known [about the potential for camaraderie among the participants] earlier ... this is a pretty decent group!”
- Participant 2: That’s how I felt, too. I called it a task because I have a ‘to do list’. Girl Scouts, then ... [the yogic dance focus group] ... then I have to go meet my mother-in-law ... then go put in grades. Now I’m here, I think, “Oh, this is good.”
- Participant 1: It [participating in yogic dance] feels like it’s for me and I mean it feels good.

Theme #2 - Increased social support would enhance yogic dance participation

—A salient theme throughout all sources of the descriptive data (e.g., preliminary one-on-one interviews, goal-setting worksheet and program evaluation responses, and focus group data) was that participants believed they would have been likely to practice more yogic dance if they were in a group environment, best exemplified by the statement, “The only thing that I would have liked more is if maybe I could have done it [yogic dance] with a group.” When the women practiced alone at home they found yoga to be acceptable for helping them relax and to calm down as evidenced by the following quotes:

- “Doing the DVD made me rest better at night.”
- “I really liked it because I was able to set aside time to quiet myself...I really need that to just quiet my mind and to concentrate on that connection....”
- “It wore me out, so I preferred to do it at night, maybe it put me in a meditative state that prepared me for bed....”

In a group setting, however, the women believed they would have felt accountable to one another and would not have wanted to disappoint one another, thereby promoting more activity. Another study participant demonstrated this sentiment by saying:

- [I prefer] the group setting because I'm social, even like us meeting today [for the focus group], I think my commitment would go up because I would be thinking about me letting you down and that "they're waiting for me." So I do think that if I was in a group setting I would be more vested.

Many of the participants mentioned group practice as a demonstrated motivator for yogic dance. One participant said:

- I was doing a church workout regimen and because it was a group setting, I would make sure I made it there, but doing it individually... that's on the back burner. ... it would be the last thing ... that commitment or that camaraderie of us working out together ... so now that I know that, I would be willing to come back to the same group next week and say, "Let's do some of this yoga...."

Another participant, after attending the focus group with other yogic dance study participants, noted the rapport that she quickly developed with the other women in the study. In doing so, she acknowledged the importance of the social support and a manner in which it could be implemented. This thread of the focus group discussion led the women to spontaneously begin to suggest ways the group could begin to meet to practice yogic dance together with the following:

- Participant 1: Like a book club, you read the book at home ... then you come together and talk about it.
- Participant 2: We meet once a week or once a month to do this as a group and learn a new step. When you get home, you think to yourself "let's see how you do over the next couple of weeks." I can see something like that.
- This sentiment was echoed in the second focus group:
- The social aspect would help. If I was doing this with a group of girlfriends and it helps you to become a little bit more accountable, because if you don't necessarily feel like it that day, they will be like, 'C'mon!' to help that motivational piece that also kind of plays in because when you do it as an individual you are the motivator.

In each of the data sources used to corroborate themes, the women found social support through group practice to be a key motivator for initiating and maintaining yogic dance and other physical activities.

Discussion/Conclusions

Preliminary interview and focus group data from the yogic dance feasibility study were integrated to provide insight into AA women's attitudes and beliefs about yoga-based physical activity and preferences regarding the delivery of the yogic dance intervention. Overall, the women in the study found the intervention to be feasible and acceptable. They were willing to attempt to use the Internet to complete surveys and to watch the online videos; however, they found some challenges. Study surveys were administered using either a write-in survey booklet or Internet-based surveys on the study Web site. The women in the study did provide some key areas in which the delivery of the intervention could be improved. These included having a user-friendly Web page interface that indicates more

clearly how to use the Web site tools (e.g., how to track activity, how to access study questionnaires, and how to view videos from an online catalog), and increased support and compatibility with multiple Internet browsers. The women found the backup DVDs useful and viewed these as DVD-ROMs on their computer monitors. When they experienced difficulty hearing the audio cues or seeing the models on the computer screen clearly, the women tended to prefer to play the DVDs on their TVs.

Culture

Though the women found the yoga-based postures to be acceptable and beneficial for relaxation and sleep, the cultural dance component of the yogic dance program also received enthusiastic responses from the participants, who found the African dance-based warm-up to be interesting and enjoyable. The women found that the program offered opportunities for social support as their families often joined in with them as they practiced yogic dance with the videos, encouraging the women to engage in more practice. Though unanticipated by the investigators, the study protocol offered additional social support opportunities via the focus groups held immediately following the intervention when the women were able to come together and share their experiences participating in the study.

The deep structural cultural enhancements to the intervention (e.g., African dance-inspired choreography in the warm-up and African drumming in the warm-up and stretching videos) were acceptable to the participants as the women felt a sense of pride and positivity in seeing the AA models of varying BMIs and the African cultural content and symbols. The majority of the study participants reported viewing the 10-minute African dance-based warm-up video regularly, citing their enjoyment in learning about African cultural principles while moving in rhythm with the yogic dance instructor.

Social support

Social support is a well-known mediator of physical activity and weight management in AA women [33,64-66]. In the current study, social support also emerged as a potential mediator to yogic dance. Though path analyses was not performed, the adapted HPM was useful in acknowledging and confirming the direction of influence from past experiences with yoga/ yoga-based activity towards an increase in leisure-time physical activity via the mediators of social support and culture.

Participants suggested various forms of social support (e.g., support from friends, co-workers, family members, significant others) as benefits or facilitators to previous positive experiences with physical activity. On the goal-setting worksheets, many of the women named their daughters, other family members, and co-workers as people to whom they would like to be accountable for meeting their physical activity goals. In AA women, family plays an important role in the uptake and maintenance of physical activity [67-69]. The mothers in the study whose children participated in yogic dance alongside them noted that the West African drum rhythms were a motivating factor in their children's participation. In terms of family support, several mothers found that being able to do their physical activity along with their children was an enjoyable experience. It is worth noting that the participants considered the intervention itself to be a form of social support and they consistently

mentioned during the focus groups that they wished they had met one another sooner in the study to practice the yogic dance postures together.

Limitations

Having a small sample size and homogeneous target population limits generalizability of these findings to the population at large. The yogic dance study targeted AA women with computers who had Internet access; therefore, the study participants may be different from AA women without computers/Internet access who were not eligible for this study. The women in the study had a relatively high education level. This could be considered a confounder, as education level is predictive of physical activity.

Implications

Given the importance of social support and culturally tailored concepts to AAs, further examination of the impact of yoga- and dance-based interventions on physical activity behavior is needed. To power future efficacy studies on appropriate effect sizes for dance and yoga, investigators need to delineate the impact of yoga practice alone from dance alone, and yoga- and dance-combined interventions. To determine the causal and mediating relationships between and among yoga- and dance-based activities with physical activity participation and MetS symptoms reduction, future studies should include multiple arms to explore the comparative effectiveness of both yoga and dance component of the yogic dance intervention. Based on the results of this feasibility study, yoga- and dance-based activities are acceptable to AA women, however increased social support and infusion of culturally sensitive concepts enhance practice.

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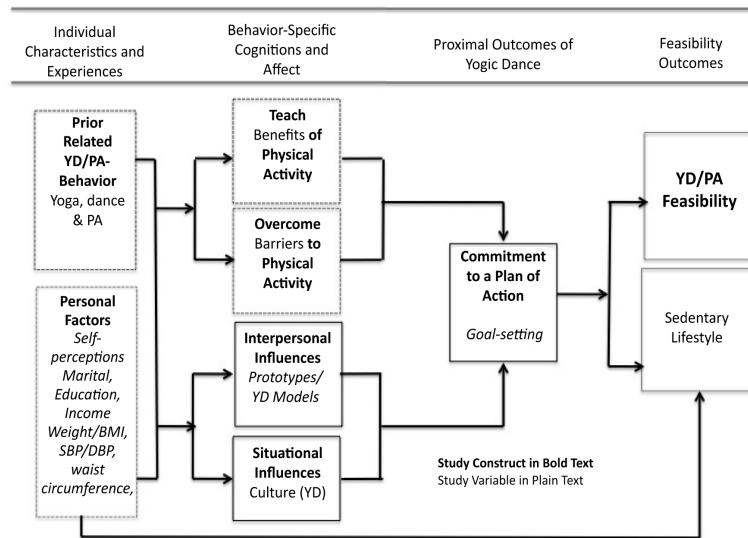


Figure 1.
Health promotion model Adapted.

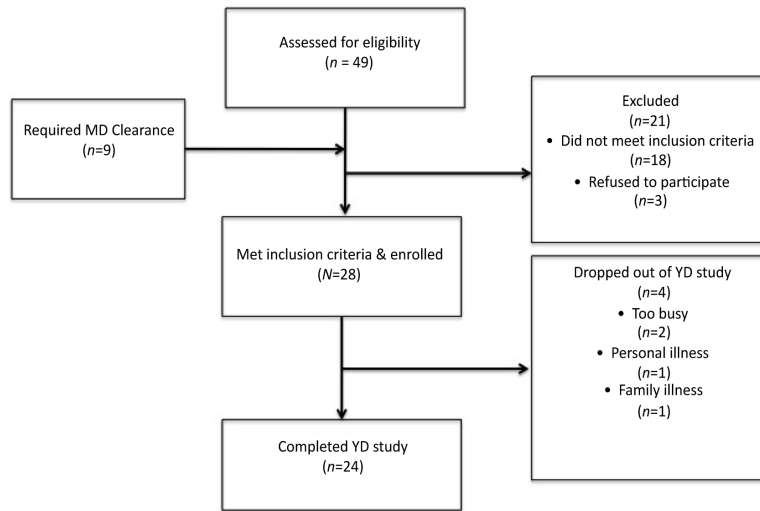


Figure 2.
YD Intervention Consort diagram

Table 1

YD Intervention Description.

Chapter	Content	Foundation	Description
1	Setting Goals for PA	SMART goals protocol	30-minute health lecture and goal-setting module targeting AA female health
2	YD Warm-up	West African dance	10-minute moderate activity warm-up based in the KuKu dance tradition
3	Mini-Lesson of War Pose	Yoga-Prayer Twist	10-minute activity that increases the suppleness of the legs, waist, and back; tones the muscles of the shoulders and sides; builds stamina and strength; and improves balance
4	Mini-Lesson of Worship Pose	Yoga-Crescent Moon	10-minute activity that strengthens and tones the muscles of the hips, thighs, and abdomen and increases the flexibility of the spine; helps develop a sense of balance
5	Mini-Lesson of Uplifting Pose	Yoga-Extended Triangle	10-minute activity that stretches the body; strengthens and tones the leg muscles; improves the flexibility of the hips
6	Mini-Lesson of Swaying Tree Pose	Yoga-Gate	10-minute activity that is a powerful sideways stretch that strengthens the muscles of the waist and helps trim the waistline
7	YD Stretching Sequence	Physical training	10-minute stretching sequence developed by a physical trainer

Table 2

Baseline characteristics of YD study participants (N = 24).

Characteristic	n (%)
	Mean (\pm SD)
Age, mean, (\pm SD)	43.4 (7.9)
Age categories, y	
35-39	11 (45.8)
40-44	7 (29.1)
45-49	1 (4.2)
50-54	1 (4.2)
55-59	3 (12.5)
60-64	1 (4.2)
Marital Status	
Married/Partnered	13 (54.1)
Single/Unpartnered	11 (45.8)
Education, mean, (\pmSD)	16.2 (2.2)
Education, categories, y	
13-15	10 (41.6)
16-19	12 (50.0)
20+	2 (8.3)
Employed	
Yes	23 (95.8)
No	1 (4.2)
Income, categories, \$	
\$0-9,999	2 (8.3)
\$10,000-19,999	1 (4.2)
\$20,000-29,999	4 (16.7)
\$30,000-39,999	5 (20.8)
\$40,000-49,999	5 (20.8)
\$50,000+	7 (29.1)
Dependents, categories, #	
0-1	16 (66.7)
2-4	6 (25.0)
5-7	1 (4.2)
8+	1 (4.2)
Health Insurance Status	
Yes	20 (83.3)
No	4 (16.7)

Table 3

Clinical characteristics of YD study participants (N = 24).

Characteristic	n(%)
Family history of CVD	
Yes	20 (83.3)
No	4 (16.7)
Family history of obesity	
Yes	18 (75.0)
No	6 (25.0)
Family history of T2D	
Yes	10 (58.3)
No	12 (41.7)
BMI, mean (\pm SD) (m²/kg)	40.8 (10.9)
BMI categories (m²/kg)	
Overweight (BMI 25-29.9)	5 (20.8)
Obese (BMI30-39)	7 (29.1)
Extremely obese (BMI40-49)	9 (37.5)
Extremely obese (BMI \geq 50)	3 (12.5)
Waist Circumference, (\pm SD) in	44.2 (7.6)
Waist Circumference	
WC normal	2 (8.3)
WC at risk for MetS (\geq 35 inches)	22 (91.7)
Systolic Blood Pressure, mean (\pm SD) (mm/Hg)	121.88 (11.8)
Systolic Blood Pressure (mm/Hg)	
SBP normal	14 (58.3)
SBP at risk for MetS (\geq 130mm/Hg)	10 (41.7)
Diastolic Blood Pressure, mean (\pm SD)(mm/Hg)	85.9 (8.6)
Diastolic Blood Pressure (mm/Hg)	
DBP below MetS	14 (58.3)
DBP at risk for MetS (\geq 85mm/Hg)	10 (41.7)

Table 4

Feasibility and acceptability of YD (N = 24).

	Measure	n (%)
Feasibility of using the Internet	consented women who remained in study	24 (100.0)
	women in study who requested paper surveys	12 (50.0)
	women in study who completed online surveys only	7 (29.2)
	women in study who used both online and paper forms	5 (20.8)
	completed YD entries	17 (70.8)
	completed Goal-setting paper worksheet	21 (87.5)
	completed program evaluation	16 (66.7)
	completed IPAQ-Baseline	24 (100.0)
	women who preferred the DVD or DVD-ROM to the online video	19 (79.2)
Acceptability of YD	consented women who remained in study	24 (100.0)
	women in study who completed all components of YD	16 (66.7)
	women who enjoyed the Warm-Up	18 (72.7)
	women who enjoyed the YD poses	15 (62.5)