A CULTURALLY TAILORED COMMUNITY GARDENING APPROACH TO INCREASING PHYSICAL ACTIVITY AND PSYCHOLOGICAL HEALTH AMONG AFRICAN AMERICAN WOMEN: A PRE-POST FEASIBILITY STUDY

BY

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DISSERTATION

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ABSTRACT

Evidence indicate that physical activity (PA) and psychological health are associated with chronic disease prevention. However, due to a variety of systemic factors, African American women (AA) engage in low levels of PA and are at an increased risk of experiencing high levels of psychological distress. Interventions designed to increase PA levels and psychological health among AA women should be culturally tailored and in addition to addressing intrapersonal factors that influence health behaviors, they should also address interpersonal and community-level factors that influence their health behaviors. Community gardening, with a Black history knowledge (BHK) component, may be an effective culturally tailored intervention to increase PA and improve psychological health because it can address multiple levels of influence (i.e., intrapersonal, interpersonal, and community-level) and increase its cultural saliency through the addition of a complementary culturally, historically relevant education component. As a result, we tested the feasibility of "Tending to Our Roots to Increase Our Wellness (TRIOWell)," an 8-week culturally tailored community gardening intervention, to increase PA and psychological health among middle-aged AA women.

In this 8-week, single group pre-post feasibility study, participants (n =11) were middle-aged AA women, between the ages of 45 and 64 years, low active, and had not gardened in the past two gardening seasons. The women were 50.8 ± 6.4 years, with 72.8% having at least a Bachelor's degree, and 63.6% were employed full-time. There were three aims for this study, and chapters two through four each report on one aim, along with findings from that aim. The first two aims are based on quantitative analyses and aim three is based on a qualitative analysis. The aims were: 1) examine pre-post changes in device-assessed and self-reported total daily PA levels among middle-aged AA women in an 8-week culturally-tailored community gardening

intervention and feasibility outcomes, 2) examine pre-post changes in psychological health among middle-aged AA women in an 8-week culturally-tailored community gardening intervention, and 3) explore perceptions of PA, Black history knowledge, health and health behaviors, and the social implications of community gardening amongst middle-aged AA women who participated in an 8-week culturally tailored community gardening intervention.

Findings from aim one demonstrated an increase in daily step count from pre-to postintervention (baseline median = 4938l.91 steps per day; post-intervention median = 5819.38 steps per day; r = 0.53; P = 0.028). Effect sizes revealed a moderate increase in device-assessed light PA (r = 0.45) and a small increase in device-assessed total PA (r = 0.29). Both self-reported leisure and total PA had small increases (r=0.17). There was also a small decrease in daily moderate-to-vigorous PA (r = -0.16). Sixty-seven percent (6/9) of women indicated that they would recommend this program to family/friends. Secondary outcomes revealed that gardening activities were characterized as a moderate intensity PA, device-assessed fruit and vegetable (FV) consumption increased from pre to postintervention (median 82-unit increase; r = 0.51; *P*=.016), and effect sizes revealed a small increase in self-reported green leafy vegetable consumption (r = 0.25). There were no effects on self-reported berries or other vegetables consumption.

In aim two, effect sizes revealed a small decrease in perceived stress scores (r = -0.2), depression (r=-0.14), and self-efficacy (r = -0.35). There were no effects on anxiety or life satisfaction. Sixty-seven percent (6/9) of women indicated that they would recommend this program to family/friends.

Aim three qualitative findings revealed the emergence of three major themes: 1) Preparing for and actively making behavior changes, 2) Newfound opportunity for community

engagement and camaraderie, and 3) Opportunities to reconstruct and enrich: Feedback for intervention components.

Findings indicate that an 8-week culturally tailored community-gardening intervention may be a feasible approach to increase device-assessed step count and FV consumption, with moderate effects on device assessed light PA, and small effects on device assessed total PA, stress, depression, and self-reported green leafy vegetable consumption among middle-aged AA women. Future studies should be adequately powered and conducted among a larger sample size to demonstrate effectiveness of community gardening on these outcomes. Interestingly, there was a small negative effect on self-efficacy and device assessed moderate-to-vigorous PA and there were no effects on anxiety and life satisfaction. It is possible that the length of the intervention was too short to elicit larger effect sizes in anxiety and life satisfaction and that the intervention should have rigorously targeted increases in moderate-to-vigorous PA and self-efficacy. These findings warrant further investigation. Lastly, gardening activities were classified as a moderate intensity PA, which suggests that gardening could be promoted as a form of PA to reach PA guidelines among middle-aged AA women.

Qualitative analyses revealed that community gardens may be an effective community-based and public health approach to preparing middle-aged AA women to increase their PA levels and FV consumption and influence middle-aged AA women to actively make health behavior changes. Opportunities for AA women to socialize are needed and social capital may be produced via community gardens amongst AA women. BHK is generally accepted as a novel approach to culturally tailor a community gardening intervention, though refinement is necessary before future implementation among a larger sample. Fitbits were acceptable amongst many women to influence increases in PA, but a variety of PA trackers should be offered. Weekly

phone calls may not be necessary to retain AA women in a community gardening intervention that targets middle-aged AA women.

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Chapter 1: Literature Review

1.1 African American Women and Health Disparities

Non-Hispanic African Americans comprise 13% of the total US population, with African American (AA) women making up 13% of the female population (DeSantis et al., 2019). Chronic health challenges disproportionately burden AAs due to historical and current systemic injustices (Lee et al., 2021). It is imperative to acknowledge and address the historical roots of these pervasive disparities, as well as shift research towards addressing community, environmental, and policy-level factors that impact AA women's health behaviors and outcomes.

Minoritized populations, like AA women, generally display worse outcomes of most physical health measures than non-Hispanic whites (August & Sorkin, 2011). The most notable race differences in health arise in middle age, and the mortality rates for middle-aged AA women have worsened since 1990 (Simons et al., 2021). Traditionally, health behavior studies and models address the individual level factors that contribute to engagement in healthy behaviors, like lack of motivation and personal preference (Campbell et al., 2007). Yet, health behavior is also influenced by social determinants of health (SDOH) (Braveman & Gottlieb, 2014). Social determinants of health are the conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks (U.S. Department of Health and Human Services, 2018). It has been well-established that socioeconomic status (SES) impacts health outcomes and health behaviors, where less formal education and lower-income are associated with poor health outcomes and health behaviors (Adler et al., 2016).

From a historical perspective, policies were favorable towards non-Hispanic Whites at the start of the United States, where immigrants of European descent received privileges like

wages for work, property ownership, and voting eligibility (Lee et al., 2021). These privileges were embedded in policies that have established the foundation of 21st-century America and have kept AAs at a disadvantage. Due to these policies, compared to non-Hispanic whites, fewer AAs receive a formal education, AAs earn less at the same educational attainment, and accumulate less wealth (Lee & Cubbin, 2009).

Health disparities exist even for college-educated, middle-class AA women (Colen et al., 2018), often called "The Health Paradox," leading researchers to recognize that additional variables, in addition to socioeconomic status, are affecting AA women. The weathering hypothesis, developed by Geronimus and colleagues, posit that the higher rates of illness and disability among Black Americans are physiological responses to social, economic, and political exclusion (Geronimus, 1992). Phelan and Link (2015) suggest that race operates as a fundamental cause of inequalities in health, and that having to endure racial stereotypes, discrimination, and institutionalized racism influences health beyond SES. As such, researchers are arguing for racism and discrimination to not only be considered as social determinants of health, but also to address structural racism as the root cause of racial health disparities (Yearby, 2018, 2020).

Using allostatic load, or a measure of the physiological dysregulation that results from cumulative chronic stress on the body (B. McEwen & Stellar, 1993), as an indicator of weathering, (Borrell et al., 2010) found that AAs show higher levels of allostatic load than non-Hispanic whites and this still held true even when controlling for poverty. Inflammation, a physiological response to stress, has also been shown to be higher among AAs when compared to white Americans (Paalani et al., 2011). It is a robust predictor of age-related chronic diseases like heart disease, diabetes, arthritis, and cancer (Liu et al., 2017; Paalani et al., 2011), all of

which disproportionately burden AA women. To combat health disparities, we must consider intersecting social identities, like race, gender, and class because each identity will contribute differently to one's lived experiences. In this section, we will examine health disparities in physical activity (PA), cardiometabolic diseases, and psychological well-being outcomes, as well as the factors that contribute to these differences.

1.2 Physical Activity Disparities

As an industry, PA has been led by wealthy, White-based values that often require high educational attainment, high income, appropriate locations, and a plethora of time (Lee et al., 2021). Due to these variables, disparities exist within PA engagement between AAs and non-Hispanic white Americans. The 2018 Physical Activity Guidelines for Americans recommends that adults aged 18-64 years old participate in 150 minutes of moderate-intensity aerobic PA per week (US Department of Health and Human Services, 2018). August and Sorkin (2010) investigated racial/ethnic differences in exercise and dietary behaviors of middle-aged and older adults. They found that 45–64-year-old AAs were significantly less likely to engage in moderate PA compared to whites. Similarly, data from the 2018 National Health survey showed that 60% of AA women were insufficiently active compared to 45% of non-Hispanic white women (National Health Interview Survey, 2018). One factor that may be contributing to these differences are environmental factors, like neighborhood safety. For example, leisure activities that are seemingly free, like walking, may be hindered by a lack of safety and fear, as AAs disproportionately live in under resourced, higher crime communities due to housing segregation (Hawes et al., 2019). Qualitative findings have shown similar outcomes. As examined in (King et al., 2000) telephone survey of middle-aged and older racial/ethnic groups of women's physical activity behavior, lacking a safe place to exercise was regularly mentioned by the AA women. Gothe and Kendall (2016) found similar findings in their focus group study of barriers,

motivations, and preferences for physical activity among older AA women, where the participants stated that physical conditions of the streets, pavement, and street lighting impeded their ability to be physically active in their neighborhoods. Though an increasing number of AAs are living in suburbs, which is associated with higher income, higher education level, and thus more resources and less crime (Lacy, 2016), we still find that there are PA disparities. In a study conducted by Scholes and Bann (2018), the proportion of adults categorized as active > 150 minutes per week was highest amongst highly educated adults, but the magnitude of the education disparity was largest among non-Hispanic whites. This finding suggests that SES variables affect groups of people differently and perhaps another variable is influencing the disparity. We continue to make this observation among AAs in health outcomes, like in cardiometabolic diseases.

1.3 Cardiometabolic Disorders and Diseases

Cardiometabolic disorders are a cluster of interrelated risk factors, primarily hypertension, elevated fasting blood sugar, dyslipidemia, abdominal obesity, and elevated triglycerides. These disorders place individuals at a greater risk of developing heart disease or type 2 diabetes (Kirk & Klein, 2009). Approximately 47 million people in the United States are living with cardiometabolic disorders, but they affect AA women at higher rates than non-Hispanic white and Hispanic women (CDC, 2017; Benjamin et al., 2019; Hales et al., 2017). In fact, AA women are disproportionately burdened by both cardiometabolic disorders, like obesity, as well as disproportionately burdened by cardiometabolic diseases like cardiovascular disease and type 2 diabetes. The prevalence of obesity is 55% (Hales et al., 2017), cardiovascular disease is 57% (Benjamin et al., 2019), and type 2 diabetes is 13% (Centers for Disease Control and Prevention [CDC], 2017). Among non-Hispanic white women, 38% have obesity, 43% have cardiovascular diseases, and 7% have type 2 diabetes and among Hispanic women, 51%, 43%,

and 12%, respectively (Curtin, 2019). AA women's cardiovascular mortality rate is also 2 times greater than that of non-Hispanic white and Hispanic women (Curtin, 2019). Physical inactivity has consistently been identified as a major modifiable risk factor for cardiometabolic disorders and diseases (Staffileno & Coke, 2006), so researchers have designed physical activity interventions with the goal of increasing physical activity levels to reduce the risk of morbidity and mortality of these conditions specifically among AA women.

1.4 Psychological Health Disparities

Psychological distress refers to non-specific symptoms of stress, anxiety, and depression and high levels of psychological distress are indicative of impaired mental health and may reflect common mental disorders, like depressive and anxiety disorders (Cuijpers et al., 2009). Discrimination, juggling multiple demands from a variety of roles (i.e., spousal, parental, communal), financial (Young et al., 2004), and occupational stress (Elliott Brown et al., 2000) are many stressors that uniquely impact AA women. In fact, discrimination is one of the most common stressors that AA women face (Banks et al., 2002). Additionally, social stress related to the intersection of race and gender exacerbates poor health outcomes for women of color, but especially for AA women (Geronimus, 1996). For example, AA women have historically held jobs outside the home, in addition to the expectation of fulfilling familial and communal roles and responsibilities (Higginbotham & Weber, 1992).

AA women are disproportionately burdened by the concurrent dysregulation of many physiologic systems (Upchurch et al., 2015). This is known as allostatic load or cumulative biological risk and it has been widely accepted that social stress negatively impacts allostatic load (Beckie, 2012). Chronic stress aids in the progression of multiple disease conditions through the extended activation of the hypothalamic-pituitary-adrenal (HPA) axis and the sympatho-adrenal-medullary (SAM) axis, which is the body's primary stress response systems (Borrell et

al., 2010). Activation of these systems stimulates an overflow of physiological scenarios like the secretion of pro-inflammatory cytokines, and with sustained elevation, it can cause damage to the body (Karlamangla et al., 2002) and surrounding tissues (McEwen, 1998). Perceived discrimination has been associated with marked and continuous arousal of the HPA axis (Busse et al., 2017). More specifically, racial discrimination as a stressor elicits negative affective states that have been associated with biological changes that are characteristic of the stress response (Tomfohr et al., 2016). In a study examining the cumulative effects of multiple stressors on women's health by race and area of residence, Schulz and colleagues (2000) found that everyday experiences with unfair treatment make a significant contribution to AA women's health status. Additionally, a strong amount of evidence has shown negative effects of discrimination on mental health outcomes, like depression (Brown et al., 2000).

Depressive disorders are very prevalent and are major public health issues among the general population (Cassano & Fava, 2002). Paradoxically, however, AAs have a higher level of exposure to a wide range of stressors (i.e. racism, perceived discrimination, socioeconomic status, high unemployment rates), but AAs also have disproportionately low rates of depression (Assari & Lankarani, 2015). Studies have demonstrated that overall lifetime prevalence of major depressive disorder (MDD) among non-Hispanic whites was 17.9% compared to 10.4% among AAs (R. K. Bailey et al., 2019). Many researchers posit that the lack of research on AA women contributes to the misdiagnosis, underdiagnosis, and undertreatment of depression in this population (Walton & Boone, 2019). Though, among AAs that are diagnosed, evidence demonstrates that the chronicity of depression is higher for AAs compared to non-Hispanic whites (Williams et al., 2007).

Similar to depression, anxiety disorders are pressing public health issues, as they are the most prevalent group of mental health disorders in the United States (Kessler et al., 2005). Also similar to depression, anxiety lifetime prevalence rates are lower among AAs compared to non-Hispanic whites, but the chronicity tends to be much higher (Asnaani et al., 2010; Breslau et al., 2005). The primary hypothesized explanation for lower prevalence rates, but higher chronicity is the diagnosis criteria may not consider cultural differences in experiences and understandings of anxiety among AA women (Hopkins & Shook, 2017), may result in the underdiagnosis, misdiagnosis, and undertreatment of anxiety disorders. Therefore, while research regarding marginalized groups' mental health has increased, there is still a major gap (Suinn & Borrayo, 2008) and warrants investigation to understand how anxiety disorders affect AA populations.

Positive psychological well-being refers to positive thoughts and feelings such as purpose in life, optimism, and happiness (Kubzansky et al., 2018). The links between psychological distress and health outcomes have been largely studied and are well understood (Kubzansky et al., 2018; Z. Zhang & Chen, 2019); however, there is a dearth of research on the associations between positive psychology and its associations with health outcomes, especially among AAs (Jeste et al., 2015; Mattis et al., 2016). Therefore, examining elements of positive psychological well-being like self-efficacy, life satisfaction, and meaning and purpose (Harris & Thoresen, 2006; Jeste et al., 2015) among AA women warrants investigation.

Self-efficacy is an individual's belief in their capacity to execute behaviors that are necessary to reach a specific goal (Bandura, 1997). With respect to PA and exercise behaviors, self-efficacy is often measured by the confidence to engage in PA/exercise despite certain barriers or the confidence to engage in PA/exercise behaviors (McAuley, 1992; McAuley et al., 1993). Self-efficacy is positively associated with PA behavior (McAuley & Blissmer, 2000; M.

D. Young et al., 2014), which may be indirectly linked with better health outcomes. A secondary analysis of data from a larger study of patients in cardiac rehabilitation (Candelaria et al., 2022), which consists of exercise programming, demonstrated that post-cardiac rehabilitation, exercise self-efficacy improves, but to a lesser extent among racial/ethnic minorities (Candelaria et al., 2023). Johnson et al., (2015) posits that environmental and familial factors may partially explain these differences, where they may hinder increases in self-efficacy. In fact in a study examining correlates of self-efficacy for PA among AA women, women with lower social role constraints were associated with higher levels of self-efficacy (Fallon et al., 2005).

Life satisfaction is a psychological construct that addresses an individual's ability to have a life that meets their needs (Karan et al., 1990) and to be happy (Andrews & McKennell, 1980). In a longitudinal analysis of life satisfaction and changes in PA, diabetes, and obesity among patients with cardiovascular diseases, lower life satisfaction was associated with obesity and physical inactivity (M. Baumann et al., 2017). According to the 2020 World Happiness Report (Helliwell et al., 2020), the United States has a lower average life satisfaction than European countries. Barger and colleagues (2009) evaluated racial/ethnic disparities in life satisfaction using the 2001 National Health Interview Survey and the 2007 Behavioral Risk Factor Surveillance System (total n combined > 350,000) and found that relative to whites, AAs and Hispanics were less likely to be very satisfied. AAs were somewhat more likely to report being dissatisfied. One potential contributor to lower levels of life satisfaction includes experiences with racial discrimination (Broman, 1997; Utsey et al., 2000).

Meaning and purpose is the sense of life having purpose and that there are good reasons for living and it has been associated with mental health outcomes (Galek et al., 2015). Data also show that maintaining sense of purpose in midlife predicts better physical health (Willroth et al.,

2021). Additionally, Willroth and colleagues (2021) found that sense of purpose decreases with age and found no differences amongst White, Asian, and AA populations.

1.5 Culturally Tailored Physical Activity Interventions

There has been a consensus that PA interventions targeting underrepresented groups, like AA women, should be culturally tailored to increase the likelihood of intervention adherence and post-intervention behavioral maintenance (Bopp et al., 2007; Duru et al., 2010; Fleury & Lee, 2006; Joseph et al., 2021; Wilcox et al., 2003). Fleury and Lee (2006) note that culturally tailored interventions are necessary for underserved and minoritized populations because they take into consideration the social and contextual correlates that may contribute to PA behavior. Incorporating Christian tenets and faith-placed components is common among many PA interventions that target AA women (Bopp et al., 2009; Whitt-Glover et al., 2012; Wilcox et al., 2010) because AAs have high levels of religiosity and are more likely to attend church (Bopp et al., 2007; Harvey et al., 2016; Levin, 1984). Additionally, some interventions have electronic- and mobile-health components since recent data shows that AA adults use many forms of technology at equivalent or greater levels than their white counterparts (Joseph et al., 2019). Other interventions rely on community-based components, like peer counselors and group sessions for culturally appropriate translation and uptake of health information (Keyserling et al., 2002). The next section will state and summarize findings from faith-based, faith-placed, community-based, and E-and m-Health PA interventions for AA women.

Faith-Based and Faith-Placed Interventions

Duru and colleagues (2010) conducted Sisters in Motion, a 6-month faith-based randomized control PA intervention to increase walking among older (>60 years), sedentary AA women. The intervention participants were divided into small groups: the intervention groups received a faith-based curriculum plus a 45-minute PA class, and the control group (one large

group) received general health education (unrelated to PA) plus a 45-minute PA class. The faith-based curriculum included 4 components, which included a resource guide based on the Community Healthy Activities Model Program for Seniors (CHAMPS) model, a community-based PA promotion program to increase lifetime PA levels of older adults (Stewart et al., 2001), as well as Scripture readings and group prayer. During the group sessions, the women set personal activity goals, and they encouraged the other women in their groups to become and remain active. The small groups also participated in weekly pedometer challenges, where the group with the greatest mean increase in step counts each week compared to baseline was considered a win.

Each member of the team with the greatest number of wins at the conclusion of the intervention received a $15 gift card. Other tailoring components included research personnel matching the participants' identity and the PA sessions included praise dancing to spiritual music and line dancing. At the 6-month follow up, the intervention group increased their weekly steps by 9,883 on average, compared to an increase of 2,426 for controls ($p=0.016$). Systolic blood pressure decreased on average by 12.5 mmHg among intervention participants and only 1.5 mmHg among controls ($p=0.007$).

Similarly, The Heart and Soul Physical Activity Program (HSPAP) (Peterson & Cheng, 2011) was a 6-week church-based PA intervention conducted among eighteen middle-aged AA women to test the feasibility of the program by determining changes in time and intensity of PA and social support for PA. The purpose of HSPAP was to provide the participants with appraisal, belonging, tangible, and self-esteem domains of social support for PA and to engage participants in fun, culturally and age-appropriate physical activities, which would thus promote the adoption of and adherence to the PA guidelines. More specifically, appraisal (informational) support was

provided through education on the PA recommendations, safety factors, and disease prevention strategies. The provision of belonging (emotional) support was through spiritual messages and by determining walking partners. Tangible (instrumental) support was given by providing the participants with the necessary facilities needed to walk. Self-esteem (self-worth) support was providing positive feedback, self-monitoring fitness and goal attainment, and giving and receiving rewards for accomplishments. This intervention focused on social support because it has been identified by AA women as an important factor that promotes an active lifestyle (Joseph, Keller, et al., 2017). To further tailor the intervention, the researchers employed an AA nurse practitioner to run the group sessions, as matching research personnel to the identity of the participants is one surface level adaptation technique to culturally tailor an intervention (Resnicow et al., 1999). At the conclusion of the program, there were significant increases in time spent in physical activity, from a mean time of 412 min/week at baseline to 552 min/week at 6-weeks (p = .044).

In a 3-month faith-based PA intervention conducted by Whitt-Glover and colleagues (2008), eighty-seven AA adults participated in eight group sessions that focused on behavioral strategies to increase daily moderate and vigorous intensity physical activity. Prior to implementation of the study, the team conducted in-depth interviews with church pastors to get their input on how best to design a culturally appropriate intervention. Conducting formative qualitative research with stakeholders and community members is a highly encouraged strategy to use when designing interventions for minoritized populations (Resnicow et al., 1999). The intervention was based on the Social Cognitive Theory, and it consisted of 8-weekly group sessions that focused on behavioral strategies to increase walking, daily moderate and vigorous-intensity physical activity. Each weekly session included 30 minutes of moderate PA led by a

certified fitness instructor and an hour-long discussion session. Additional tailoring components included each session opening and closing with prayer, the session content focused on personal health care as a method of protecting God's temple, and culturally relevant rewards, like faith-based aerobic videos and a T-shirt with a faith-based slogan.

After four sessions, steps per day, measured by a pedometer, increased by 846 +/- 2047 steps to an average of 5729 +/- 2230 steps per day (p = .04; 18% increase). At 12-weeks, there was a 28% increase in daily steps. Though the sample size was not large enough to detect statistically significantly differences, there was a decrease in participants classified as sedentary (36% after 4 weeks, 32% after 12 weeks), and an increase in the proportion of participants who were classified as somewhat active (20% after 4 weeks, 28% after 12 weeks).

Community-based Interventions

In a community-based walking program at a church conducted by Adams and colleagues (2015), twenty-five AA women aged 35-69 received a Stanford Walking Kit (Breitrose & Hanna, 1998) to help them develop a personal walking routine. This walking kit provides women with a warm-up sheet that demonstrates how to warm up their muscles, as well as sheets that provide suggestions as they move through the program. Five weekly group sessions, led by the principal investigator, were offered to the participants to offer support. The women were encouraged to ask questions and to share any barriers or achievements to their walking during the previous week. The Stanford Walk Kit also contained prompts for the women to find time to walk and to get the women motivated for action.

At post-intervention, two participants (6.9 percent) reported that they did not walk, compared to five participants (17.2 percent) pre-intervention. Though there was a decrease in the number of participants who reported walking every day from pre-intervention to post-intervention, nine participants to eight participants, respectively, there was a significant increase

in weekly moderate PA minutes (93.5 minutes to 99.23 minutes). This study suggests that adding a community component, like hosting a program at a familiar, local location like a church and an intervention with small group discussions, may increase program saliency among AA women. Keyserling et al. (2002) conducted a study among AA women with T2D that investigated the impact of adding a community-based component.

"The New Leaf Program," (Keyserling et al., 2002) was a program designed to increase self-care behaviors, like PA, among AA women with T2D. The clinic-based intervention group received four, monthly individual counseling visits, the clinic-based intervention plus the community component also received two group sessions and monthly telephone calls from a peer counselor, and the minimal intervention group participants were mailed an educational pamphlet. The peer counselor from the community component is a community diabetes advisor, which they describe as a non-professional peer counselor. They were AA women with T2D, and their primary purpose was to provide the women with social support for their behavior changes and to emphasize their behavior change goals. Community health workers (CHW), like the community diabetes advisor in The New Leaf Program, have been utilized in health promotion programs among minoritized populations as a means to increase community engagement (Swider, 2002). The U.S. Department of Health and Human Service defined CHWs as lay members of the community who either work for pay or who volunteer in partnership with the local health care system (US Department of Health and Human Services, 2009). They also often match the identity of the targeted community in relevant ways (disease status, race, gender) (Swider, 2002). A survey conducted by Rosenthal (1998) found that CHWs provide cultural mediation, informal counseling and social support, culturally appropriate health education, advocacy for individual

and community needs, assurance that people get the services they need, build individual and community capacity, and provide direct services (Rosenthal, 1998).

During the sessions, the women were encouraged to accumulate daily moderate PA and to increase the minutes of moderate and vigorous intensity activities. Both the clinic-intervention and clinic plus community-component groups produced significant differences in the average mean of PA compared to the minimal intervention group (44.1 kcal/day ($p = 0.0055$ and 33.1 kcal/day ($p = 0.029$). This study did not find significant differences in PA energy expenditure between the clinic-group only and clinic plus community component, though the community component appeared to have a favorable effect on PA during the second 6 months of follow-up, where energy expenditure decreased for the clinic-group, and energy expenditure increased for the clinic plus community component. When asked about the intervention, 86% of the participants said that the peer counselor's role in the program was important. In all, it appears that community- and faith-based interventions may be an efficacious strategy to increase PA levels.

Electronic-and mobile-Health Interventions

Lastly, E- and m-Health (electronic and mobile health) interventions have been shown to be an effective way to increase PA and to reduce risk factors associated with cardiometabolic diseases; however, this work has been conducted primarily among non-Hispanic white populations (Joseph et al., 2019). E- and m-health interventions may also be efficacious for AA women as recent 2021 Pew Research Center data shows that 91% of AAs report using the Internet, 77% of AAs use at least 1 social media site, and 99% of AA adults own a cellular phone of any type, with the majority owning a Smartphone (83% own a Smartphone). According to this data, technology may be a plausible avenue to reach AA women.

Joseph and colleagues (2015) conducted a print vs culturally tailored Facebook and text message 8-week intervention to promote PA among AA women. In this study, fourteen women were randomized to the Social Cognitive Theory (SCT) based and culturally relevant Facebook and text message delivered intervention group and fifteen women were randomized to the non-culturally tailored print-based intervention, which consisted of promotion brochures. The purpose of the study was to increase moderate-intensity PA to meet the 2008 Physical Activity Guidelines of 150 minutes per week (US Department of Health and Human Services, 2008). PA messages were delivered to the women on their private Facebook group wall, and they included information about low PA levels specifically among AA women, addressed unique barriers to PA, like hair care and body shape preferences, and the images used in these messages were of AA women with a diverse range of body sizes and skin tones. There were also weekly Facebook discussions based on prompts to encourage social support among the women and for the women to share their personal experiences.

Furthermore, the prompts were meant to align with an SCT construct. An example of one prompt was, “What strategies can you use each day to engage in more physical activity?” and this targeted self-regulation. The Facebook group also received motivational text messages. Three text messages per week were sent to motivate and promote PA. They served as another method of social support and they provided tips like, “(e.g., “Set aside time today for several 10–15-minute walks. Walking 30 minutes at a moderate intensity on 5 days each week = 150 minutes!”). Accelerometer measured PA showed that the Facebook group participants decreased sedentary time (Facebook = −74 minutes/week vs. print-based = +118 minute/week; $p < 0.5$) and increased light intensity (Facebook = +95 minutes/week vs. Print-based = +59 minutes/week; $p <$

0.5) and moderate-lifestyle intensity PA (Facebook = + 27 minutes/week vs. Print-based= −34 minutes/week; $p < 0.5$) in comparison to the Print-based group.

Joseph and colleagues (2021) also adapted the Facebook and text message program to middle-aged AA women (50-65 years old), where they tested the feasibility and acceptability of *Smart Walk*, a 4-month culturally tailored, smartphone-delivered PA intervention. The purpose of this intervention was for participants to meet the national guidelines of 150 minutes per week of at least moderate intensity PA, with walking as the most promoted form of PA to achieve the goal. Using the many features of the *Smart Walk* app, like personalized profile pages, multimedia PA promotion modules delivered via brief videos, discussion boards, and PA tracking tool that integrates with FitBit activity, the participants were provided with a variety of culturally tailored mediums that intended to meet the social, cultural, and behavioral norms of the women, to thus translate into successful behavior change: an increase in PA.

Specifically, the profile pages were made to mirror social media sites like Facebook and Twitter, so the women could share biographical information with the other study participants. These profiles were created to guide the building of a web-based community and social support network for PA. Weekly multimedia video and text-based modules were the main delivery types for the educational and behavioral parts of the program, where the material was written at less than an 8th grade reading level and the videos were short in duration (3-7 minutes). All videos were narrated by an AA woman in her mid-thirties. During the first three months of the intervention, the modules focused on PA promotion and during month 4, the modules focused on PA maintenance. PA promotion modules were complemented with the discussion boards, where the women could give and receive social support to each other. All participants received a FitBit Inspire HR and were able to track their step count and moderate-to-vigorous PA through the

Smart Walk app. Lastly, participants received three PA promotional text messages each week and these text messages were formulated by other AA women in previous research (Joseph, Ainsworth, et al., 2017; Reese et al., 2017).

At the conclusion of the study, the participants increased moderate-to-vigorous PA by a median of 30 minutes per week ($r = 0.053$; $P = 0.002$) and they reported improvements in self-regulation ($r = 0.397$; $P = .01$) and behavioral capability ($r = 0.440$; $P = .006$). Most of the participants (93%) said that they would recommend the intervention to a friend. They also recommended enhancing the intervention's provision of social support, but in all, it appears that E- and m-Health interventions may be an effective way to increase moderate-to-vigorous PA among middle-aged AA women.

Interestingly, Zhang and Jemmott (2019) conducted a pilot randomized control trial of a mobile-based small-group PA intervention among younger AA women (18-35 years) to meet the goal of engaging in at least 90 min/day of light-intensity physical activity (LPA) during the 3-month study period. Previous studies have aimed to increase moderate-to-vigorous PA, so it is unique for a study that targets AA women with the goal of increasing LPA. They decided to target LPA because of the growing evidence surrounding its benefits (Buman et al., 2010; Butcher et al., 2008; Canton et al., 2024; Healy et al., 2007; Migueles et al., 2021).

In this study, the PennFit app was developed and based off both SCT and formative research with other AA women. The women in the control group could use the app to monitor their step count and LPA through their FitBit and the staff recommended the women to manually enter exercise minutes for specific workouts involving moderate or vigorous PA. In the PennFit App-Based Small Group Intervention group, participants could use all the features of the PennFitt app. Features included personal profile pages, direct messaging to the women in their

group, and self-monitoring of their PA data, as well as viewing the PA data of the other group members.

Results indicated that participants in the intervention group had higher odds of meeting the intervention goal (OR = 1.48; p = .048) than did the control group participants and this effect lasted the entire 3-months. About 81% of the intervention group participants met the daily goal of 90 min/day of LPA during the intervention period and both the control and intervention group gave high ratings of the program (8.3/10 (SD = 2.2) and 8.5/10 (SD = 2.2), respectively).

In conclusion, these studies generally demonstrate feasibility, acceptability, and preliminary efficacy of culturally tailored PA interventions for AA women. These studies are not without limitations, like the high use of self-report PA measures, small sample sizes and convenient samples, and short study duration, but the programs have produced beneficial change.

1.6 Light-Intensity Physical Activity and Health Outcomes

Recent data has demonstrated the potential health benefits of participation in light-intensity PA (LPA) (i.e., leisure walking; activity >1 and <3 metabolic equivalents) (Buman et al., 2010). Some researchers are now investigating LPA and its potential health benefits, especially among older and inactive populations because the current moderate-to-vigorous PA recommendations may be less feasible to achieve for these populations (Dogra et al., 2021). As such, Butcher and colleagues (2008) conducted an 8-week light intensity exercise program which consisted of walking 10,000 steps, three times a week among 34 sedentary adults (mean age 45.6 ± 11.1 years) to investigate whether light intensity exercise regulates lipid metabolism and the transcription factors peroxisome proliferator-activated receptor γ (PRARγ) and liver X receptor α (LXRα) are responsible for controlling reverse cholesterol transport. This mechanism was investigated because PA reduces the risk of CVD through regulating plasma lipids.

The walking program (n = 17) was supervised, the participants completed all walking on a treadmill, and the participants chose their own walking speeds. Participants in the control group (n = 17) continued with their regular lifestyles. Fasting blood was sampled at baseline, and after weeks 4 and 8 of exercise. Blood samples were collected either 24 hours before the start of the exercise study or 24 hours after an exercise session. Blood analyses demonstrated that compared to the controls, there was a significant decrease in total cholesterol (pre-exercise: 5.73 ±1.39 $mmol \cdot L^{-1}$; postexercise: 5.32 ±1.28 $mmol \cdot L^{-1}$) and a significant increase in HDL (pre-exercise, 1.46 ± 0.47 $mmol \cdot L^{-1}$; postexercise, 1.56 ± 0.50 $mmol \cdot L^{-1}$). They also found significant increases in serum oxidized LDL (oxLDL) concentrations in the exercise group before and after exercise (0wk , 554 ± 107 $ng \cdot mL^{-1}$; 4wk, 698 ± 134 $ng \cdot mL^{-1}$; 8wk 588± 145 $ng \cdot mL^{-1}$). In all, these changes through light-intensity aerobic exercise increase oxLDL uptake, which stimulates reverse cholesterol transport, and as a result promotes the clearance of proatherogenic lipids from the vasculature, which ultimately contributes positively to cardiovascular health.

Men (n = 67) and women (n = 106) (Mage = 53.3±11.9 years) from the 2004-2005 Australian Diabetes, Obesity, and Lifestyle (AusDiab) study without diagnosed diabetes were recruited to participate in an observational study examining associations of device-assessed measured sedentary time, LPA, moderate-to-vigorous PA with fasting and 2-h post challenge plasma glucose (Healy et al., 2007). Participants wore accelerometers for 7 consecutive days and intensity was categorized as sedentary time (accelerometer counts/min ≤ 100; average hours/day), light-intensity (counts/ min 100-1951), and moderate- to vigorous-intensity (counts/min ≥1,952). They also fasted overnight for a minimum of 9 hours, then took an oral glucose tolerance test. Forced entry regression models were used to analyze the data and demonstrated that sedentary time was positively associated with 2-h plasma glucose (b = 0.29,

95% CI 0.11–0.48, P = 0.002); LPA (b = -0.25, -0.45 to -0.06, P = 0.012) and moderate-to-vigorous PA (b = -1.07, -1.77 to -0.37, P = 0.003) were negatively associated with 2-h plasma glucose. LPA remained significantly associated with 2-h plasma glucose after adjusting for moderate-to-vigorous PA (b = -0.22, -0.42 to -0.03, P = 0.023). This study also contributes greatly to the literature in that the outcomes were objectively measured and suggests that LPA is beneficially associated with blood glucose.

Buman & colleagues (2010) examined associations between LPA and health and well-being among older adults (66 years of age or older) in The Senior Neighborhood Quality of Life Study. Participants were mailed accelerometers and self-rated health surveys. They were instructed to wear the accelerometers for 7 consecutive days and 6-months later asked to fill out another survey and to wear an accelerometer again for 7 consecutive days. Health indicators in the survey included general health rating, cognitive ability, number of falls in the past year, among others, and the indicators were categorized into physical and psychosocial health categories. PA intensities were categorized according to the Copeland threshold accelerometry cut points because this threshold divides the light-intensity category into two thresholds: low-light and high-light. The rationale is that the lower and upper thresholds of LPA may be more appropriate to categorize activity among older adults and since LPA ranges from standing to leisure walking, each threshold may elicit their own health benefits.

Using three different regression models, Buman and colleagues (2010) found that both low-and high-light PA were positively related to physical health (P < 0.0001) and well-being (P < 0.0001) and replacing 30 minutes a day of sedentary time with equal amounts of low-light or high-light PA was associated with better physical health (P < 0.0001). In fact, high-light PA had the strongest association with physical health, where an increase of 30 minutes/day was

associated with a 0.46 standard deviation increase in the physical health score. High-light PA was also positively associated with well-being, whereas low-light PA and moderate-to-vigorous PA were unrelated to well-being. Though the participants spent a statistically significant higher amount of time in high-light PA per day compared to moderate-to-vigorous PA (Timepoint 1: 35.5 and 21.3 ($p < 0.001$), respectively and Time 2: 33.1 and 22.3 ($p < 0.001$), respectively), magnitude wise the times only differ by about 10-15 minutes per day, so the data suggests that high-light PA may be just as good as MVPA to reap health benefits for this population.

1.7 Community Gardening and Health

Current evidence suggests that participation in community gardens, or green spaces where individuals from multiple families grow food communally or side-by-side (Litt et al., 2018), may positively affect both physical and mental health. Qualitative and cross-sectional studies show that gardeners report feeling an increased sense of community (Kingsley et al., 2020; Suto et al., 2021), perceived better social cohesion compared to non-gardeners (Lampert et al., 2021; Soga et al., 2017), higher engagement in regular PA compared to non-gardeners (Sommerfeld et al., 2010; Van Den Berg et al., 2010), feelings of positive mental well-being (Koay & Dillon, 2020; Van Den Berg et al., 2010), and adequate intake of fruits and vegetables compared to non-gardeners (Booth et al., 2018a). Within the PA literature, gardening is proposed as a light-to-moderate-intensity PA; however, few studies have implemented gardening as an intervention (Alaimo et al., 2016).

Park and colleagues (2016) conducted a quasi-experimental gardening intervention for elderly women (age > 70 years) at community centers and found that women in the gardening group ($N = 24$) significantly increased their muscle mass, aerobic endurance, hand dexterity, cognitive ability, and decreased their waist circumference. These findings suggest that gardening may improve physiological outcomes, but they also conclude that future interventions with a

larger sample size and a longer intervention period are needed to establish the effect of a gardening intervention. Van Den Berg and Custers (2011) conducted an experimental study where thirty allotment gardeners (these gardeners garden at an allotment complex with private plots) performed a Stroop task and then were randomly assigned to 30-min of outdoor gardening or indoor reading. Salivary cortisol levels and self-reported mood were measured before and after the activities. There was a higher reduction in the cortisol in the gardening group compared to a reading-control group. This study demonstrated that gardening could induce relief from acute stress. However, this study was conducted among gardeners. These individuals may already enjoy gardening and likely believe that gardening is beneficial, so this may also increase their sensitivity to positive physiological change (Van Den Berg & Custers, 2011). Therefore, the authors suggest that future studies include non-gardeners, as well as a larger sample size. Though, the current literature examining gardening and health is overwhelmingly cross-sectional and qualitative.

Booth et al. (2018) examined the relationship between the level of participation in community gardens and health behaviors, psychological well-being, and perceptions of the community through surveys of regular, occasional, and non-community gardeners. Regular and occasional gardeners reported better mental health, occasional gardeners reported a higher vegetable intake, and regular gardeners reported more sense of community. Level of participation in community may be associated with health outcomes. Koay and Dillon (2020) assessed the relationship between community gardening and mental health benefits like, subjective well-being, stress, and resilience through a survey among 111 residents in Singapore. Community gardeners reported significantly higher levels of subjective well-being than individual/home gardeners and non-gardeners. Community gardeners also reported higher levels

of resilience and optimism than the non-gardening group. Similarly, Soga et al. (2017) explored the health benefits of urban allotment gardening, a type of community garden, among Japanese adults. Participants (N=332) filled out a questionnaire that assessed perceived general health, subjective health complaints, body mass index, mental health, and social cohesion. Allotment gardeners compared to non-gardeners reported better perceived general health, subjective health complaints, mental health, and social cohesion. Cross-sectional data suggests that community gardening is beneficial to both physical and mental health. Many qualitative studies have comparable findings.

Hale et al. (2011) conducted semi-structured interviews and group interviews with 67 gardeners to understand the gardener experience. These interviewees identified the garden as a place for a holistic sense of health and well-being. They believed that biophysical and social learning through gardening is related to their eating preferences and practices, their PA behaviors, and their mental health. A gardener noted that growing your own food makes you want to taste the food; you feel a sense of accomplishment. They argue that these feelings, together, lead to a holistic sense of well-being. Many of these gardeners reported developing a more holistic relationship with PA and exercise. Many mentioned how gardening requires physical labor like digging and bending, which they consider to be exercise, but also how they often walk (about 30-35 min) or bike to the garden, too. The entire process of walking to the garden in addition to gardening, one participant viewed it as "healthy doing." Likewise, Kingsley et al. (2009) interviewed ten members from an urban community garden in Melbourne, Australia. They were exploring perceptions of health and well-being benefits associated with membership. Participants described the garden as a sanctuary where people could come to escape daily stressors. They also identified spiritual, PA-related, and nutritional benefits.

Many of these studies, however, have limitations such that they are often conducted among predominately non-Hispanic-white populations (Draper & Freedman, 2010). Since minoritized populations, like AA women, participate in lower levels of PA when compared to non-Hispanic-white populations and experience higher prevalence of chronic diseases, gardening interventions should be designed and culturally tailored towards other racial/ethnic groups to increase participation. A community garden intervention may also better appeal to AA women since community gardening is a highly social activity and social support is a primary predictor and motivator of PA behavior among AA women (Bopp et al., 2009; Duru et al., 2010b; Joseph et al., 2021).

1.8 Social Capital and Health

Social capital is a collective asset (i.e., trust and norms of reciprocity) formed through group membership. The trust formed within the group can be thought of as "social credits," so more investment into the groups and relationships gives one more access to these credits (Bourdieu, 1986). Social credits may be drawn upon to access both tangible and intangible (i.e., social support) resources. An example may include a group of neighbors informally keeping an eye out on each other's homes when one is not home. Social capital has been hypothesized as a determinant of health (Rodgers et al., 2019). Many researchers have suggested that social capital may improve physical health through the spread of information and norms regarding health behaviors, the promotion of access to and the use of health services, and the cultivation of psychological support (Iwase et al., 2012). In a systematic review conducted by Rodgers et al. (2019) of studies examining social capital and physical health, self-rated health, cardiovascular disease, and mortality had the greatest percentage of combined positive and mixed findings (92%, 87%, and 78%, respectively), with self-rated health as the most frequently examined outcome.

Kim and colleagues (2021) conducted a cross-sectional study examining personal social capital and self-rated health among middle-aged adults. In this study, bridging social capital, or the connections between community residents with different status and power, and bonding social capital, or the links between community residents whose social identities are similar (Putnam, 2000) were measured. They found a positive relationship between both bonding and bridging social capital with self-rated health. More specifically, they found SES differences, where individuals from low household income, bonding social capital was positively associated with greater self-rated health, but the relationship was not apparent among middle and high household incomes. Additionally, this study added to the empirical literature in that they also investigated the role of leisure time PA on the links between social capital and self-rated health.

Researchers have taken an interest in the potential relationship between social capital and PA since social support is related to social capital and social support has long been established as a PA correlate (McAuley & Blissmer, 2000). Although Kim and colleagues (2021) did not find a mediating role of LTPA in the relationship between social capital and self-rated health, they stated that a different operationalization of social capital may have revealed different findings. Many researchers hypothesize, and some may even "over glamorize" the potential positive effect of social capital because it involves social networks and social support, both of which often correlate positively with health outcomes, but an overwhelming majority of studies report mixed findings between social capital and health (Rodgers et al., 2019). A major limitation that is likely contributing to these mixed findings is the variation of conceptualization and measurement of social capital (Rodgers et al., 2019).

In Rodger and colleague's (2019) review of social capital and physical health, their findings illuminated the lack of consensus in social capital measurement. First, social capital can

be examined at either the individual or the societal levels (Eriksson, 2011). Researchers must define specifically at which level they are utilizing to examine health outcomes because each level may have differential health effects. Secondly, social capital can be broken down into "structural," or what people do, vs "cognitive," or what people feel and "bridging," "bonding,", and "linking" social capital (Kawachi et al., 2008). Tools to capture social capital must specify the type of social capital because like at different levels of social capital, different types of social capital may produce different health effects. Lastly, studies often conflate or use other measures interchangeably with social capital, like social support, sense of belonging, and neighborhood quality (Kawachi et al., 2008). However, many of these features are consequences of social capital (Harpham, 2008). Future studies should focus on including specific and standardized measures of social capital to understand the relationship between social capital and health accurately.

In addition to examining its potential beneficial effects, it is also necessary to examine potential *negative* effects of social capital. Portes (1998) categorized the negative effects of social capital into four categories: 1) Exclusion of outsiders, 2) Excess claims on group members, 3) Restrictions on individuals freedoms, and 4) Downward leveling norms. In fact, social capital may also come in the form of social sanctions or obligations, which may affect groups or individuals negatively (Villalonga-Olives & Kawachi, 2017). A cross-sectional study examined the relationship between contextual social capital and health (i.e., self-rated health and lifestyle risk factors) among Japanese adults who were a part of Parents and Teachers Association, sports clubs, alumni associations, political campaign clubs, citizens groups, and community associations (Iwase et al., 2012). Findings demonstrated that bridging social capital was inversely related with poor health and that bonding social capital was not consistently

associated with better health. Using the Parents and Teachers Association membership as an example, they argued that women benefitted more from bridging social capital versus bonding social capital because they are usually the *designated* members of these associations, and their participation as a result may become more of an *obligation*. Participation out of obligation may counteract benefits of social capital. Furthermore, because of patriarchy, women are often excluded from groups with bridging social capital (i.e., networks comprised of individuals from varying backgrounds with access to a variety of resources), but when given access to these groups, they may reap (health) benefits. In all, when attempting to leverage social capital for health benefits, it is necessary to evaluate the social identities and resource access, as social capital may not be equally beneficial. Social capital has also been examined qualitatively in relation to health and leisure activities.

Wiltshire and Stevinson (2018) conducted interviews through a social capital lens among participants of *parkrun,* a United Kingdom-based organization that offers weekly timed running events for free around the world (parkrun, 2017). They wanted a sociological understanding of PA among low socioeconomic groups. Findings from the study demonstrated that participants utilized existing social ties (i.e., family, friends, neighbors), a primary component of social capital, to initiate PA. Secondly, the participants benefited from the labor of the parkrun volunteers, which also translated to additional forms of support. Lastly, the participants used newly gained social capital to also access cultural capital related to injury management, performance, and health. These findings also suggested that social capital can potentially be created through participation in PA and positively influence health among low-SES populations if individuals are provided with free resources, like *parkrun*. Similarly, Campbell & Gillies (2001) examined social capital with respect to health promotion in a micro-qualitative study of

peoples' subjective experiences of community life in two small communities in south-east England. The authors argue that health behavior change can only occur if a community is health enabling, but one must first understand what constitutes a healthy community and social capital as a concept may be able to explain the phenomena. Analogous to the *parkrun* study, Campbell and Gillies (2001) found that small, informal network of friends and neighbors (i.e., social ties) formed the majority of social capital available to the participants. Accordingly, informal social ties should be highly considered when developing policies and interventions that will create "health enabling communities."

Glover (2005) conducted telephone interviews, focus groups, and in-person interviews with community garden members in St. Louis, Missouri. Community gardens are "a collective venture that entails the formation of a social network" (Jamison, 1985). Glover and colleagues (2005) state that the social interactions during the gardening project can foster norms of reciprocity and trust, which are conventional forms of social capital. Furthermore, friendships developed during the project can become year-round social ties. The findings from the interviews revealed that "leisure episodes," which were defined as moments of friendly chatter while getting water or speaking about gardening in the garden space, are especially important to building strong ties, or connections among people that are used for sharing information, knowledge, feelings, and experiences. Similarly, Kingsley et al., (2020) explored six urban community gardens in Melbourne, Australia through semi-structured interviews to understand social capital stocks and other related elements like mutual support, social networks, and community connections. The results in this study indicated that community gardens enable connections and mutual benefits that enhance a sense of community. The sharing of information and enhancement

in a sense of community through leisure, both components of social capital, may positively contribute to physical and mental health.

1.9 Health Behavior Theories (Intervention/Design)

Behavior change interventions should be guided by theory or models, yet few interventions are designed with a theoretical framework (Michie et al., 2014). Furthermore, the National Institute for Health and Care Excellence (2007) states that efficacious behavior change interventions are those that simultaneously target population, community, and individual levels. "Amplifying Health Through Community Gardens" (Alaimo et al., 2016) is a framework for advancing multicomponent, behaviorally based neighborhood interventions, like community gardens. This model is informed by many existing theories and models like the Socioecological Model (SEM) (Breslow, 1996) and Social Cognitive Theory (SCT) (Bandura, 1986). To better understand Amplifying Health Through Community Gardens, this review will also explain SEM and SCT, as many constructs from both will be utilized in the intervention.

SEM is derived from ecological theory within the biological sciences, where ecologists posited that organisms and their environments are interrelated (Green et al., 1996). Overtime, this same concept has been applied within the behavioral sciences and public health, to better understand human health behaviors (Green et al., 1996). One strategy of the socio ecological model for promoting healthy behavior is to involve the social processes and agencies that significantly influence individual behavioral choices (Breslow, 1996). Essentially, environments must also be suitable for individuals to successfully engage in healthy behaviors. Breslow provides three categories of social processes: microsocial environments, health-specific agencies and institutions, and other agencies that can be included into health-promoting action.

Microsocial environments, Breslow describes, are the social networks of individuals which consist of family, friends, work and neighborhood associates, and formal and informal

organizations. Evidence has consistently demonstrated a positive association between perceived social support and better health behaviors and outcomes (Berkman et al., 2000), including PA (Joseph et al., 2021; Zhang & Jemmott, 2019). Among AA women, family and friends have been emphasized as significant motivating variables and resources for convincing attitudes towards PA (Joseph et al., 2021). A framework that incorporates SEM principles may be effective in creating behavior change among AA women. SEM also encourages targeting macrosocial environments.

Macrosocial environments include the health-specific agencies and other institutions that can be included into health-promoting action (Breslow, 1996). Health-specific agencies include health professions, public health departments, and voluntary health organizations, and these organizations often collaborate to develop health promoting programs and initiatives. For example, local, state, and federal public health departments have joined forces with health professionals and volunteers to form organizations like the American Cancer Society and the American Heart Association to fund research for a given disease and to provide information on the given disease to the public at large. Other institutions that can be included in health promotion include faith-based organizations, schools, and government agencies. Specifically, among AA women, churches have been influential organizations on health behaviors like PA and diet (Harmon et al., 2014), since AAs have high levels of religiosity and are more likely to attend church (Bopp et al., 2007; Harvey et al., 2016; Levin, 1984). Once again, a framework that emphasizes the inclusion of macrosocial environments may be especially efficacious among minoritized populations because they take into consideration the social and contextual correlates that may contribute to PA behavior (Fleury & Lee, 2006).

In this study, interpersonal (microsocial) and community-level (macrosocial) spheres of influence were targeted through the incorporation of social support via discussion groups and communal gardening. Discussion groups allowed the women to share knowledge, ideas, and stories with each other, as well as learn information from each topic that relates to community gardening, PA, and health. This represents appraisal and emotional support; providing the community garden space represents instrumental support (Kahn & Antonucci, 1980). Moreover, involving local community garden leaders, incorporating input from church pastors and their congregants, as well as utilizing churches for recruitment represents involving organizations that can be included in health promotion. These components, when implemented together, appropriately apply SEM and Amplifying Health Through Community Gardens.

The Social Cognitive Theory (SCT), in which Bandura (1986) postulates that human behaviors result from the mutual and changing interactions between personal factors and socio-environmental factors is also included with Amplifying Health Through Community Gardens. SCT is widely used in the PA literature, with the self-efficacy construct contributing the most to the literature (Rhodes & Nigg, 2011). Self-efficacy is an individual's confidence in their ability to change their behavior with a certain level of success (Rhodes & Nigg, 2011), and a robust amount of evidence shows self-efficacy is strongly and persistently associated with PA (McAuley & Blissmer, 2000). Along with self-efficacy, social support, though not a primary construct, is considered in the model. SCT highlights that enduring a short-term inconvenience for a long-term, beneficial goal requires self-regulation (Rhodes et al., 2019). Self-regulation depends on gained concrete skills for managing oneself (Rhodes et al., 2019). One way that self-regulation can be achieved is through the enlistment of social support, or when someone finds

people who encourages their endeavors to exercise self-control. Educational topics targeted the development of both self-efficacy and social support.

Community gardening may impact intrapersonal factors, like self-efficacy, attitudes, and preferences towards health behaviors like PA. To target intrapersonal factors, an educational topic addressed barriers to PA for example. The model includes intrapersonal factors as socio-environmental mediators and processes. Relatedly, interpersonal factors are also considered as socio-environmental mediators and processes. These factors may include social support and collective efficacy. Engagement in community gardens may lead to increases in neighborhood social support due to the interaction with neighbors, family, friends, and other gardeners (Alaimo et al., 2016). These interactions may also lead to collective efficacy (Teig et al., 2009), which is defined as "the link between mutual trust and shared expectations to intervene for the common good of the neighborhood" (Teig et al., 2009). Lastly, environmental factors, like aesthetics, food access, and places to be active, are included as socio-environmental mediators and processes. One example of environment impacting health behaviors and as an extension health outcome is the provision of the space to garden. The action of gardening may evoke positive emotions, like joy and pride, because one is growing their own food, as well as pride and joy about one's own neighborhood (Hale et al., 2011). In the model, intrapersonal and interpersonal factors have a bi-directional relationship and interpersonal and environmental factors have a bi-directional relationship. The framework suggests that they influence health behaviors, like PA.

Community gardens offer the space for PA. Park and colleagues (2008) found that active older adults who meet the PA recommendations five or more days per week through gardening had higher physical functioning and lower pain when compared to low-intensity gardeners and

non-gardeners. An additional benefit and strategy to get more individuals active is that specific gardening activities can be given to individuals based on ability level (Park et al., 2011). PA changes through community gardening may influence disease markers and the associated health outcomes.

Evidence supports that gardening can improve health and restore mental health (Sommerfeld et al., 2010). Zick and colleagues (2013) found that gardening may even positively influence weight control, which has a strong association with health outcomes. Gardeners report feeling an increased sense of community (Kingsley et al., 2020; Suto et al., 2021), perceived better social cohesion compared to non-gardeners (Lampert et al., 2021; Soga et al., 2017), and feelings of positive mental well-being (Koay & Dillon, 2020; Van Den Berg et al., 2010). Though the relationship between community gardening and health outcomes is compelling, the Amplifying Health Through Community Gardens framework also emphasizes the indirect impact that contextual factors may also play on these relationships. The model emphasizes how individual factors, neighborhood, and environmental conditions may also affect the relationships in the models. In fact, the model suggests that these contextual factors will influence each section of the model: the community gardening intervention, the socio-environmental mediators and processes, health behaviors, and health outcomes. This suggests that researchers designing interventions need to take the contextual factors into consideration, too.

An additional framework that was utilized in the study is the "Black history knowledge (BHK) model of coping and mental health." This framework incorporates a construct called, "Black history knowledge (BHK)," which several scholars suggest is a significant psychological strength that aids mental health, especially among Black youth (Chapman-Hilliard & Adams-

Bass, 2016). The framework postulates that four BHK tasks: 1) Awareness of structure of race and racism in US, 2) awareness of contributions and achievements, 3) awareness of capital positioning (social, political, economic), and 4) awareness of cultural strengths that foster empowered action influences vulnerability level and risk, as well as net stress and reactive coping. A higher level of BHK may be associated with a lower risk of poor mental health and a lower level of BHK may be associated with a higher risk of poor mental health. BHK was embedded throughout the education portion with the hypothesis that increasing knowledge of one's history positively influences well-being. Furthermore, this construct was evaluated qualitatively post-intervention to understand the women's perspective on a historically based educational component to the community gardening intervention.

Chapter 2: A Culturally Tailored, Community Gardening Approach to Increasing Physical Activity Among Middle-Aged African American Women

Abstract

Background: Examine the feasibility of an 8-week culturally tailored community-gardening intervention to increase physical activity (PA) among middle-aged African American (AA) women. **Methods:** Eleven insufficiently active AA women between the ages of 45-64 years who had not gardened in the past two gardening seasons participated in a single-group pre-posttest feasibility study. The intervention consisted of twice weekly, 1-hour gardening sessions and 30-minute educational workshops. The educational workshops included a novel approach to cultural tailoring by embedding Black history knowledge (BHK) within the context of community gardening. Device-assessed (Fitbit Charge 3) and self-report PA (Recent Physical Activity Questionnaire) were assessed at baseline and postintervention. Feasibility was assessed using a postintervention survey and through recruitment, retention, and adherence. Secondary outcomes included gardening activity intensity (heart rate assessed by Fitbit Charge 3 and rate of perceived exertion [RPE]) and fruit and vegetable (FV) consumption (Veggie Meter®; food frequency questionnaire) at pre and postintervention. Wilcoxon signed rank tests examined changes in pre-post measures. Effect size estimates were calculated using, *r*. **Results:** Participants increased device-assessed daily step count (median 880 steps per day increase; r = 0.53; *P* = 0.028) and FV consumption (median 82-unit increase; r = 0.51; *P*=.016). Effect sizes indicated a moderate effect on device-assessed light PA (r = 0.45) and a small effect on device-assessed total PA (r = 0.29) and self-reported green leafy vegetable consumption (r = 0.25). There was a small negative effect on moderate-to-vigorous PA (r = -0.16). There were no effects on self-reported other vegetable consumption. Gardening activities were categorized as a moderate-intensity PA. Sixty-

seven percent (6/9) of women indicated that they would recommend this program to family/friends. **Conclusions:** A culturally tailored, community-gardening intervention may be a feasible approach to increase step count and FV consumption, but future studies should be adequately powered and the BHK component should be modified before larger scale implementation.

Keywords: community-based research, mental health, chronic disease, health disparities

Introduction

African-American (AA) women are disproportionately burdened by cardiometabolic diseases, like obesity, cardiovascular disease, and type 2 diabetes (Joseph et al., 2021). The prevalence of these diseases is 55% (Hales et al., 2017), 57% (Benjamin et al., 2019), and 13% (CDC, 2017) respectively, and they affect AA women at higher rates than non-Hispanic white and Hispanic women (Curtin, 2019). Physical activity (PA) is an effective non-pharmacological approach to reducing risk of developing cardiometabolic diseases, yet PA levels among AA women are low (Wahid et al., 2016). Fruit and vegetable (FV) consumption has also been shown to reduce the risk of developing cardiometabolic diseases (Wallace et al., 2020). Systemic factors that contribute to these disparities include but are not limited to redlining, which has caused residential segregation and results in AA women living in areas with less access to a high quality built environment for PA participation (Lee & Cubbin, 2009) and to grocery stores for FV purchases (Ryabov, 2016). As such, there is a need for the development and implementation of novel, multi-level, evidence-based interventions to eliminate health disparities and achieve health equity amongst AA women.

Community gardening may be an effective approach to increase PA and FV consumption among middle-aged AA women. A pre-post quasi-experimental study tested the effects of

community gardening activities on PA among adults with overweight and obesity and found statistically significant increases in self-reported total PA in the intervention group (Mohamed et al., 2018). Qualitative and cross-sectional studies show that compared to non-gardeners, gardeners engage in more PA (S.-A. Park et al., 2009; Sommerfeld et al., 2010; Van Den Berg et al., 2010) and report an adequate intake of FV (Booth et al., 2018). However, more community gardening studies in general are needed among marginalized populations (Tracey et al., 2023), like AA women and specifically, more community gardening *interventions* need to be conducted (Alaimo et al., 2016; Guitart et al., 2012; Litt et al., 2018).

Community gardening may specifically appeal to AA women because it is a highly social activity and social support is a primary predictor and motivator of PA participation among AA women (Ainsworth, 2003; Fleury & Lee, 2006; Wilcox et al., 2003). Furthermore, the overall lighter intensity of gardening may also better appeal to AA women, as qualitative studies demonstrate that AA women often report preferences for walking, dance, and yoga/stretching instead of higher-intensity, traditional exercise like going to the gym to run and lifting weights (Bopp et al., 2007; Gothe & Kendall, 2016). Increasing evidence has demonstrated the potential health benefits of participation in light PA (Buman et al., 2010; Canton et al., 2024; del Pozo-Cruz et al., 2018) and it has also been recommended to examine total daily PA, which includes both exercise and non-exercise activity throughout the day (del Pozo-Cruz et al., 2018), especially among low-active populations, as the traditional focus on increases in moderate-to-vigorous PA may initially be too challenging among low active populations (Dogra et al., 2021). In this study, heart rate data and rate of perceived exertion (RPE) were also collected to estimate the intensity of specific gardening activities (i.e., pruning, mulching, watering, planting) when performed among low-active, middle-aged women. Much of the current data on gardening as a

potential PA is based on findings from older adults (S.-A. Park et al., 2014), so there is a need to investigate gardening intensity across age ranges.

There has been a consensus that PA interventions targeting underrepresented groups, like AA women, should be culturally tailored to increase the likelihood of intervention adherence and post-intervention behavioral maintenance (Bopp et al., 2007; Duru et al., 2010; Fleury & Lee, 2006; Joseph et al., 2021; Wilcox et al., 2003). Fleury and Lee (2006) note that culturally tailored interventions are necessary for underserved and minoritized populations because they take into consideration the social and contextual correlates that may contribute to PA behavior. Since minoritized populations, like AA women, participate in lower levels of PA when compared to non-Hispanic white populations and experience higher prevalence of chronic diseases, gardening interventions should be designed and culturally tailored for AA women to increase participation. As such, including a culturally, historically relevant educational component, known as "Black History Knowledge," (BHK) to a community gardening intervention may increase cultural saliency and as a result, increase adherence to the intervention with increases in PA and FV consumption as a consequence.

In Black Psychology, a construct called "Black History Knowledge (BHK)" is defined by contemporary scholars as "a chronicling of the collective historical and present-day experiences of Black people in America" (Adams, 2005). Since the 1800s, scholars like Dr. Carter G. Woodson and W E. B. DuBois, have justified the significance of history for the advancement of Black people (Chapman-Hilliard & Adams-Bass, 2016). Charles Seifert, a Black historian and author, coined the quote, "a people without knowledge of their past history, origin, and culture is like a tree without roots" (Seifert, 1938) and largely used by the leader of the Pan-Africanism movement, Marcus Garvey, which suggests that knowledge of our backgrounds is necessary for

our development and well-being. Several scholars offer that this construct is a significant psychological strength that guides mental health for Black people, as they face racial injustices (Adams, 2005; Thompson & Alfred, 2009). Chapman-Hilliard and Adams-Bass (2016), propose the BHK model of coping and mental health, where they predict that those with a higher level of BHK will have a lower negative impact on their mental health when faced with stressors, like racial injustice.

Therefore, the purpose of this study is to examine the feasibility of "Tending to Our Roots to Increase Our Wellness" (TRIOWell), an 8-week culturally tailored community gardening intervention to increase daily total PA levels among middle-aged AA women. Gardening activity heart rate and RPE, as well as FV consumption were secondary outcomes. We hypothesized that TRIOWell would be a feasible approach to increase daily total PA levels among middle-aged AA women. We also hypothesized that the intensity of the gardening activities would vary between light, moderate, and vigorous intensities and that TRIOWell would be a feasible approach to increase FV consumption.

Methods

TRIOWell was a one group pre-posttest quasi-experimental design. It can be used with small sample sizes and is an effective design for feasibility studies (Schweizer et al., 2016). The study was approved by the University of Illinois Urbana Champaign Institutional Review Board. All participants provided written consent prior to data collection. Participants were free to withdraw at any point of the study.

Participants and Recruitment

Inclusion criteria for the participants included: 1) Self-identify as African American and female, 2) 45-64 years, 3) not have gardened in the past two gardening seasons, 4) <3 days or <90 minutes of moderate-to-vigorous physical activity per week, and 5) access to a smartphone, laptop, and/or tablet. Exclusion criteria included: 1) use of walking aids (cane, walker, wheelchair) and 2) ineligibility according to the Exercise Assessment and Screening for You (EASY) assessment (Chodzko-Zajko et al., 2012).

Approximately one year prior to recruitment, research staff developed rapport with a local church, local gardeners, and park district directors. The team attended regular meetings with gardeners and directors, as well as attended church services and Bible study sessions. Recruitment took place between May and July 2023, and we aimed to recruit 15 women. Participants were recruited via in-person and media-based approaches, including churches, community events (i.e., local Juneteenth celebrations, local live music events), the University of Illinois Urbana Champaign Black Faculty and Professionals Alliance newsletter announcement, the University of Illinois Urbana Champaign e-Week, and word of mouth. Those who were interested gave their contact information to a member of the research team and were contacted by the team to be screened for study eligibility.

Testing

The baseline assessments lasted for 1-hour in duration and consisted of questionnaires, demographics, vitals (i.e., resting heart rate and blood pressure), and anthropometric measures (weight and height). Participants also received their Fitbit Charge 3 and were provided with personalized e-mail addresses and passwords made by research assistants to create a Fitbit account to use the Fitbit app; the Fitbit app was downloaded to their cell phones during the

baseline assessment (all participants had either iOS Apple or Android cell phone). They were provided with a brief orientation and instruction packet to learn how to use the Fitbit and the app. Participants were instructed to wear the Fitbit as soon as they received it during baseline assessment and for the duration of the study, including when not gardening (total of approximately 11-weeks). After participants completed their baseline assessments and received their Fitbits, they received $15. Participants also received $15 for completing post-intervention assessments. Additionally, participants who attended more than 80% of sessions were able to keep their Fitbits.

Demographics

We collected demographic variables including, age, marital status, number of children, number of people in the household, caregiver status, educational attainment, and employment status. Food security status was also collected using the United States Department of Agriculture Household Food Security Survey 6-Item Short Form (Blumberg et al., 1999) to provide another proxy of socioeconomic status. We also collected self-report health status including sleep time, smoking status, general health rating, and health history.

Intervention

TRIOWell was an 8-week culturally tailored, community gardening pre-post feasibility trial. It consisted of educational workshops and gardening. A description of the components is provided below.

Educational Workshops: TRIOWell consisted of a total of 15, twice-weekly, 30-minute educational workshops (group discussions) led by a research staff person. Educational workshops took place on the same day as gardening sessions and took place prior to the gardening sessions. One session during week 5 took place virtually on Zoom due to inclement

weather. Educational workshops took place directly before the gardening sessions at two locations: a local church and library meeting room. Topics covered during the workshops included the history of gardening among AA women, addressing barriers to physical activity participation, environmental justice in Black communities, and climate change.

The purpose of the workshops was to provide social support and complementary sessions to the gardening sessions via Black History Knowledge (BHK). Previous gardening studies demonstrate that adding an educational component to the gardening enhances the program (Alaimo et al., 2008) and culturally-tailoring the sessions through BHK would also likely enhance the receptivity of the programming. The curriculum is predetermined, where each day there is a different lesson. We encouraged an open dialogue and discussion at each session, but many sessions included accompanying activities to assist in discussion development (i.e., listening to a podcast, worksheets). Week 8 consisted of a final game and a potluck celebration. The full curriculum can be found in Table 1.

Table 1. Educational Workshop Curriculum.

Week	**Topic**	**Theories/Models**
1.1	a. Getting to know each other b. Introduction to Physical Activity	Social Cognitive Theory- **Knowledge**
1.2	Addressing Barriers to Physical Activity and Utilizing Physical Activity Assets a. What are some current barriers you face to being physically active? b. What is already in our surroundings that can help us become more active? c. How to set achievable PA goals?	Social Cognitive Theory- **Self efficacy**

Table 1 (cont.)

2.1	Utilizing Community as Social Support to engage in healthy behaviors a. Think of communities that you are a part of; list them out b. Do you feel that they support you in becoming physically active?	Social Cognitive Theory- **Social Support** Socio-ecological Model- **Community Level**
2.2	All about Community Gardening a. Types of Gardens b. When community gardening became popular c. What community gardens are used for	Socio-ecological Model- **Community Level**
3.1	History of African American Women and Gardening a. Which types of food did AA women grow? b. Who benefitted from their gardens?	Black History Knowledge
3.2	Continued History of African American Women and Gardening a. Exploring AA women's relationship with the environment	
4.1	Food Justice/Power a. Food access b. Exploring food and its relationship with the American Civil Rights Movement	Black History Knowledge
4.2	Continued Food Justice/Power a. How has food been used to resist white supremacy?	
5.1	Food Systems a. What makes up a food system?	Socio-ecological model- **Policy Level**

Table 1 (cont.)

5.2	Food Systems a. What programs/policies are there at the local, state, and/or federal level that address parts of the food system?	
6.1	Climate Change and Health a. What is climate change? b. How does it impact our health?	Socio-ecological Model- **Policy**
6.2	Continued Climate Change and Health a. Current programs and policies in place at the local/state/federal levels to combat climate change	
7.1	Environmental Justice a. What is environmental justice? b. Current examples of environmental injustices	Black History Knowledge Socio-ecological Model- **Policy**
7.2	Environmental Activism throughout Black History a. Historical activists, programs, and movements b. Current activists, programs, and movements today	Black History Knowledge

Gardening Intervention: Participants engaged in a total of 15, twice-weekly, 1-hour long gardening sessions led by a horticultural educator from the local community. Gardening sessions took place on the same day as educational workshops and took place directly after the educational workshops. One session during week 5 was rescheduled to the following week due to inclement weather; thus, participants engaged in 3 gardening sessions during week 6. The gardening sessions took place following the education workshops at two community gardens both located in Champaign, Illinois.

Participants gardened at one garden site during the week and at the additional gardening site on the weekend. During the gardening sessions, the horticultural educator, who was a 39-year-old Black woman, followed a lesson plan, as well as reminded the women to keep moving as much as possible and to also take breaks as needed. Much of the learning was experiential, where the horticultural educator verbally instructed, while physically demonstrated gardening skills to the participants. In the beginning sessions, participants were instructed on how to prune and weed, given that these two tasks are central to gardening upkeep. Participants were often split into groups and tasked with different jobs to gain experience in a variety of gardening skills. For example, during the first session, participants pruned tomato bushes, while another group weeded the garden. The groups switched after 20 minutes. Given that we utilized existing community gardening spaces, participants also assisted with other gardeners' work, including watering the plants, and harvesting the produce. The horticultural educator donated the harvested fruits and vegetables to the surrounding community, and the participants often took home with them their harvested fruits and vegetables, including but not limited to bell peppers, jalapeño peppers, pears, and tomatoes.

Prior to, 30-minutes in, and after each gardening session, participants filled out heart rate and RPE sheets. An example of the sheets may be found in Appendix A. Using their Fitbits, participants recorded their current heart rate and RPE. The sheet also asked participants to include the activity in which they were just participating before taking their heart rate and RPE.

Weekly Phone Calls: Participants received weekly phone calls, (but also received emails or texts as after the first week of calls, some women preferred email or text) as reminders for upcoming sessions, to troubleshoot Fitbit concerns, to give reminders to wear the Fitbit as much as possible, and to discuss general PA goals. We also included weekly communication as a form

of frequent contact to show a strong sense of caring, which is a recruitment and retention strategy suggested by Staffileno et al., (2006) when working with Black women participants. During conversations, some women were vulnerable (i.e., embarrassed that they only took a certain amount of steps) during the phone calls, for example, and in response, research staff responded with compassion and encouraged participants to continue to make changes no matter how small.

Framework and Theoretical Basis of the Intervention

The intervention was modeled after a theoretical model called, "Amplifying Health Through Community Gardens," (AHTCG) which is designed to link community gardens and health (Alaimo et al., 2016). This theoretical model is informed by many theoretical frameworks, like socio-ecological models, social cognitive and social determinant theories, the relational nature between people and places, and social capital. Alaimo & colleagues (2016) describe community gardens as a "multi-component, behaviorally based socio-environmental intervention," given that they can affect intrapersonal, interpersonal, and environmental processes, as well as influence health behavior changes, like diet and physical activity, which influence chronic diseases and mental health (Alaimo et al., 2008; Litt et al., 2011). TRIOWell intervention components primarily aligned with the Social Cognitive Theory and the Socioecological Model.

Social Cognitive Theory (SCT) (Bandura, 1986) postulates that human behaviors result from the mutual and changing interactions between personal factors and socio-environmental factors. Socioecological Model (SEM) provides a theoretical framework for understanding the interrelations among a variety of personal and environmental factors in human health and illness (Stokols, 1996). The levels of influence on health behaviors in this framework may include intrapersonal factors, interpersonal interactions, organizational policies and resources,

community and geographic resources, structures and systems, and policy factors (Fleury & Lee, 2006). Table 2 provides brief explanations of how the intervention embedded constructs and concepts from these theories.

Table 2. Amplifying Health Through Community Gardens (Social Cognitive Theory and Socio-ecological Model) Constructs and Concepts that Guided the Intervention Components.

Model Components	**Intervention Component**

Intrapersonal Level- involves individual attitudes, knowledge, beliefs, and perceptions that influence a behavior	• Behavioral Capability: knowledge and skill to perform a PA
	  ○ **Education Workshop Topics** addressed:
	  ▪ Definitions of PA and exercise
	  ▪ Different types of PA (i.e., leisure, transportation)
	  ▪ Barriers and assets of PA
	  ○ **Gardening Instruction:**
	  ▪ Horticultural educator led gardening sessions to teach participants how to garden, which is a type of leisure PA
	• Self-efficacy: confidence in oneself to take action and overcome barriers
	  ○ **Education Workshop Topics** addressed:
	  ▪ Barriers and assets of PA topic
	  ▪ Encourage engagement in all types of PA to demonstrate that small changes are enough
	  ○ **Weekly Phone Calls**
	  ▪ Brainstormed ways to overcome barriers to achieve any personal PA goals
	• Self-regulation: ability to manage social, cognitive, and motivational processes to achieve a desired goal
	  ○ **Fitbit Charge 3 and Fitbit App**
	  ▪ Participants utilized the Fitbit and the app to self-monitor and track daily PA (i.e., steps, heart rate)
	  ○ **Education Workshops**
	  ▪ Opportunity to gain social support
	  ○ **Weekly Phone Calls**
	• Outcome Expectations: anticipated outcomes of engaging in PA
	  ○ **Education Workshop Topics**
	  ▪ Outcomes of participating in community gardening and other types of PA
	  • Better mental health
	  • Hypertension management

Table 2 (cont.)

Interpersonal Level- social influence from friends and family and norms within social networks	• Social Support: the perception and actuality that you are cared for, have assistance from other people, and that you are a part of a social network
	  ○ **Education Workshops**
	  ▪ Group-based discussions
	  ▪ Topic on community as social support for PA
	  ▪ Definition of social support
	  ▪ Types of social support
	  ▪ Historical connection draws on the historical relevance of kinship in Black communities
	  ○ **Gardening Sessions**
	  ▪ Communal gardening sessions with participants, horticultural educator, and research staff

Community Level- the influence of settings in which people have social relationships, like schools, workplaces, and neighborhoods	• **Utilization of established locations in communities where participants live**
	  ○ Randolph Street Community Garden- Champaign, IL
	  ○ Doulgass Park Community Garden- Champaign, IL
	  ○ Champaign Public Library Douglass Park Branch- Champaign, IL
	  ○ Champaign Church of the Bretheren- Champaign, IL
	• **Established rapport with staff at the Champaign Park District, volunteers with the Solidarity Gardens, and garden steward at the Randolph Street Community Garden to help promote gardening at their locations as a wellness program**

Cultural Tailoring of TRIOWell

Resnicow's culturally-tailoring framework describes *surface* and *deep-structure* cultural adaptations when designing culturally-sensitive interventions (Resnicow et al., 1999). Surface structure cultural adaptations are the simplest forms of tailoring, where intervention materials are matched to "superficial" characteristics of the targeted population. Deep structure cultural adaptations are more complex and requires a deeper understanding of the cultural, social,

historical, environmental, and psychological factors that influence health behaviors of the targeted population. Surface-level tailoring of TRIOWell included:

- Holding education workshops at a church, given 75% of African Americans identify as Christian (Pew Research Center, 2021)
- Including images of Black women and families in the workshop materials
- Intervention delivery solely by Black women.

Deep-structure tailoring included:

- Fostering social support through group-based discussions during the education workshops since many AA women value close and kinship-like relationships in their lives
- Considering collectivism and highlighting during discussions how staying healthy themselves will allow them to better care for their family and communities
- Embedding BHK throughout the education workshops to foster racial pride

"Black History Knowledge" as a novel approach to culturally tailoring PA interventions

The BHK model is a framework that attempts to illustrate the interrelationships of risk associated with structural and systemic oppression, BHK awareness domains, stress and coping responses, and mental health outcomes because of these relationships. The model is intended to describe these relationships among Black youth, where evidence has indicated that Black youth who have a strong knowledge of their history may better cope with race-related stressors and discrimination (Adams, 2005; Thompson & Alfred, 2009). However, it also has implications for Black people across the lifespan. Research suggests that race-related stress that occurs during youth may have long-lasting psychological effects into adulthood page (Gibbons et al., 2012), so continuing to learn about the vast and unique history of Black people may also be beneficial for

adult Black women. The model centers on four BHK awareness domains: 1) awareness of the structure of race and racism in the U.S., 2) awareness of contributions and achievements, 3) awareness of capital positioning (social, political, economic), and 4) awareness of cultural strengths that foster empowered action. These domains intend to emphasize strength, resilience, and achievements within Black history versus solely focusing on a deficit-based Black American historical education. We embedded and targeted these domains within the education workshops by including a "Historical Connection" with each topic.

Historical connections were related to the educational workshop topics and the workshop topics were based off fundamental PA and exercise psychology topics (i.e., PA guidelines, social support, self-efficacy), evidence on the multicomponent nature of community gardening (Alaimo et al., 2016), and publicly available community gardening lesson plans. For example, The Nature Conservancy, a global environmental organization, provides an educator resource community garden lesson plan (Nature Conservancy (U.S.), n.d.). Their plan introduces gardens as being able to filter water, provide habitat, improve soil, reduce carbon footprint, and engage the community. In TRIOWell, we had two workshops on climate change, in which we discussed agricultural contribution to greenhouse gas emissions and its overall impact on climate change and as an extension, our health.

One of the domains of BHK is awareness of contributions and achievements. Including historical connections that target Black people's contributions demonstrates that Black people had vibrant cultures pre-Transatlantic Slave Trade and we propose that this would contribute positively to the acceptance and salience of TRIOWell, which would translate to improvements in PA and psychological health outcomes. Examples of historical connections from the workshops are available in Appendix B.

Outcomes

Self-reported outcomes were assessed using Research Electronic Data Capture [REDCap] (Harris et al., 2009, 2019) hosted at the University of Illinois Urbana Champaign, with a research personnel reading the questionnaires to the participant and marking the responses for the participant. Questionnaires were filled out this way as another approach to build rapport with the participants (Staffileno & Coke, 2006).

Physical Activity Outcomes

Device-assessed PA. Participants were asked to wear the Fitbit Charge 3 on their non-dominant wrist for a minimum of 11 weeks in total: at least 2-weeks prior to the start of the intervention (Weeks -1 and 0), during the intervention (Weeks 1-8), and 1-week after the intervention (Week 9). Week -1 served as a trial week, as evidence indicates that participants may be reactive and increase their PA shortly after receiving a wearable (S. Baumann et al., 2018) and as such was not included in analysis. PA from Week 0 was included as baseline data. PA data are reported as steps, minutes in light-intensity PA, minutes in moderate-to-vigorous intensity PA, and total minutes in PA (light-intensity minutes + moderate-to-vigorous intensity minutes).

Self-report PA. The Recent Physical Activity Questionnaire (RPAQ) (Besson et al., 2010) assesses time spent in usual PA in the past month in 4 domains (work, travel, recreation, and domestic life). Levels of physical activity energy expenditure, based off METs, can be calculated by multiplying the associated METs value by the number of hours performing the activity using this questionnaire. Self-reported total PA was calculated by summing domains of recreation PA (i.e., leisure) and work PA.

Secondary Outcomes

Gardening Activity Intensity

Device-assessed Heart Rate. Participants recorded their heart rate before, at 30-minutes, and after gardening activities by tracking it with their Fitbit Charge 3. A generalized list of gardening activities based off the participant's heart rate sheets was generated and averages of heart rates were calculated.

Rate of Perceived Exertion. Participants recorded their rate of perceived exertion (RPE) before, at 30-minutes, and after gardening activities using a 0-10 RPE scale based off the Modified Borg Scale (Borg, 1982). Averages of participant's RPE for individual gardening activities were calculated.

FV Consumption

Device assessed FV Consumption. The Veggie Meter® is a portable device that measures skin carotenoid (colorful plant pigments found in fruits and vegetables with light filtering and antioxidant properties that deposit in the skin) concentrations. It uses reflection spectroscopy to assess reflection of light from the skin (fingertip) after exposure to a source of white LED light. The Veggie Meter® has been validated amongst racially/ethnically diverse adult samples (Pitts et al., 2023) and serum samples have been highly correlated with skin carotenoids that were measured using the Veggie Meter® (Jilcott Pitts et al., 2022). However, there is no standardized protocol for using the Veggie Meter®, so this introduces the potential for user-related differences to impact the measurements (Radtke et al, 2021). Radtke and colleagues (2021) proposed recommendations for a standardized protocol, in which we used for TRIOWell. To use the Veggie Meter®, participants placed a clean and dry ring finger on their non-dominant hand on a convex lens where a white LED light is passed through while gentle

pressure is applied to the fingertip. We took 3 separate measurements and calculated the average of the scores to use for analyses.

Self-reported Food Frequency Questionnaire. The MIND diet (Morris et al., 2015) is a 15-item food frequency questionnaire that assesses the consumption of 10 brain healthy food groups (green leafy vegetables, other vegetables, nuts, berries, beans, whole grains, fish, poultry, olive oil and wine [moderate]) and 5 unhealthy food groups (red meats, butter/margarine, cheese, pastries/sweets, and fried/fast food). We assessed green leafy vegetables, other vegetables, and berries. A score of 0, 0.5, and 1 are given for each component according to the frequency of consumption. A score of 1 for an item indicates meeting the suggested intake of food item.

Data Analysis

Descriptive statistics (mean, frequency, percentage) were used to summarize demographic characteristics. Because of the small sample size (n = 11) and not meeting normality assumptions, we conducted non-parametric analyses. Wilcoxon signed-rank tests were used to examine pre- versus post-intervention changes in study outcomes and effect sizes were estimated by calculating, *r*. Statistical significance was set at a P value of < 0.5 as a point of reference because the study was not powered enough to detect significant changes in study outcomes.

Results

Demographics

Participants included in the analysis (n=11) had a mean age of 50.8 (SD 6.4) and a mean BMI of 35.9 (SD 5.2) kg/m^2. One participant did not want their blood pressure and heart rate recorded due to experiencing the "white coat syndrome," and thus if we took their blood pressure, we would likely record an inaccurate reading. They explained that they were already

under the care of a physician. Overall, 36.8% (n = 4) were married, 27.3% (n =3) were single, 27.3% (n =3) were separated/divorced, and 9.1% (n =1) were widowed. Additionally, 9.1% (n =1) had a high school diploma/GED, 9.1% (n =1) attended some college, 9.1.% (n=1) had an Associate's degree, 45.5% (n =5) had a Bachelor's degree, 9.1% (n =1) had a Master's degree, and 18.2% (n =2) had a PhD. The participants were primarily full-time employed (n = 7; 63.6%). Table 3 provides a description of participant characteristics.

Table 3. Participant Characteristics.

Demographics	n	*M* ± *SD* or %
Age, years	11	50.8 ± 6.4
BMI, kg/m	11	35.9 ± 5.2
Blood Pressure, mm Hg		
Systolic	10	114.8 ± 11.2
Diastolic	10	74.4 ± 5.6
Resting Heart Rate, bpm	10	82.3 ± 14.2
Education		
Bachelor's degree	8	72.8
Employment Status		
Full Time, ≥ 35 hours/week	7	63.6
Marital Status		
Single or Separated/Divorced	6	54.6
Number of Children		
3 or more	6	54.6
People in household		
4 or more	4	36.4
Caregiver (unpaid)	3	27.3
Sleep		
< 7 hours per night	6	54.6
General Health Rating		
Fair or Good	9	81.9
Chronic Condition		
High Blood Pressure	3	27.3
Food Insecure	1	9.1

Feasibility and Acceptability

Recruitment

Thirty-seven people expressed interest in participating in TRIOWell. Of these 37 people, 13 were eligible, and 12 provided informed consent to participate in the study, resulting in a 63% recruitment rate. Though, one participant withdrew from the study at week 3; this participant did not participate in any of the intervention due to increasing tooth pain and a change in her dental surgery date. Figure 1 provides a detailed participant flow using Consolidated Standards of Reporting Trials (CONSORT) diagram.

Retention

In total, 11 (100%) participants completed post-intervention surveys and interviews. Seven (63.6%) participants provided all post-intervention Fitbit data, surveys, and interviews.

Adherence

On average, participants attended 60% (9/15 sessions) of the education workshops and 53% (8/15 sessions) of the gardening sessions. We also calculated attendance according to the day of the week. On average, participants attended 62.5% (5/8 sessions) of the Saturday education workshop sessions and 42.8% (3/7 sessions) of the Tuesday education workshop sessions. Participants attended 62.5% (5/8) of the Saturday gardening sessions and 57.1% (4/7) of the Tuesday gardening sessions.

Acceptability

One item in the 19-item post-intervention evaluation asked, “Would you recommend this program to family/friends?” Of the participants who completed the evaluation (n=9), 6 (66.7%) indicated that they would recommend this program to family and friends, 2 (22.2%) said that they were not sure, and 1 (11.1%) did not answer.

Additional Feedback from Participants about the Acceptability and Feasibility

Among participants who completed the evaluations (n=9), 7 (77.8%) indicated that they were satisfied with the education sessions and 2 (22.2%) indicated neutral. Of those who reported a neutral response, one person commented that "they were ok…I think I was expecting more ed. [education] related to actual gardening, nutrients, coaching." All nine participants liked the gardening sessions and were satisfied with the historical connections in the education sessions. Seven participants (77.8%) felt that the gardening sessions encouraged them to be more physically active. One participant who was dissatisfied noted, "There weren't any lessons or interactions to teach/show us how to bring the information into our daily routines." Five participants (55.5%) reported satisfaction with the historical connections encouraging them to change their physical activity levels, 2 (22.2%) indicated that they were neutral, and 2 (22.2%) felt unsatisfied. Seven participants (77.8%) felt that Black History could be used in future health and wellness programs to help people be more physically active, while 2 (22.2%) felt neutral. One participant noted, "Yes, if the historical connections are physically active related; could consider adding info from black nutritionists, black trainers." The feedback was quite extensive and largely indicated that more explicit explanations should have been made between the historical connections and gardening sessions, and how they were expected to translate into behavior change. However, many comments were also positive:

> *The days I did attend was very educational, fun, learning about our historical connections to gardening, meeting new friends, and gardening itself was hard work, but fun at the same time. Will do it again.*

> *I realized that even the smallest movement was exercise and good for you.*

I used it as a reminder to keep up with my evening walks (Regarding the weekly phone calls/texts)

It reaches back to our roots. (Regarding liking the gardening sessions)

This should be taught as a course especially for youths (Regarding Black history being used for other health and wellness programming)

Ms. Heather was great! (Regarding our horticultural educator)

Physical Activity Outcomes

Table 4 displays device-assessed and self-report PA outcomes.

Wilcoxon analyses indicated an increase in daily step count from pre-to postintervention (baseline median = 4938l.91 steps per day; post-intervention median = 5819.38 steps per day; r = 0.53; P = 0.028). Effect sizes indicated increases in daily light PA (r = 0.45) and small increases in total daily PA (r = 0.29). There was also a small decrease in daily moderate-to-vigorous PA (r = -0.16). Analyses revealed a small increase in self-reported leisure PA (r = 0.17) and a small increase in self-reported total PA (r = 0.17).

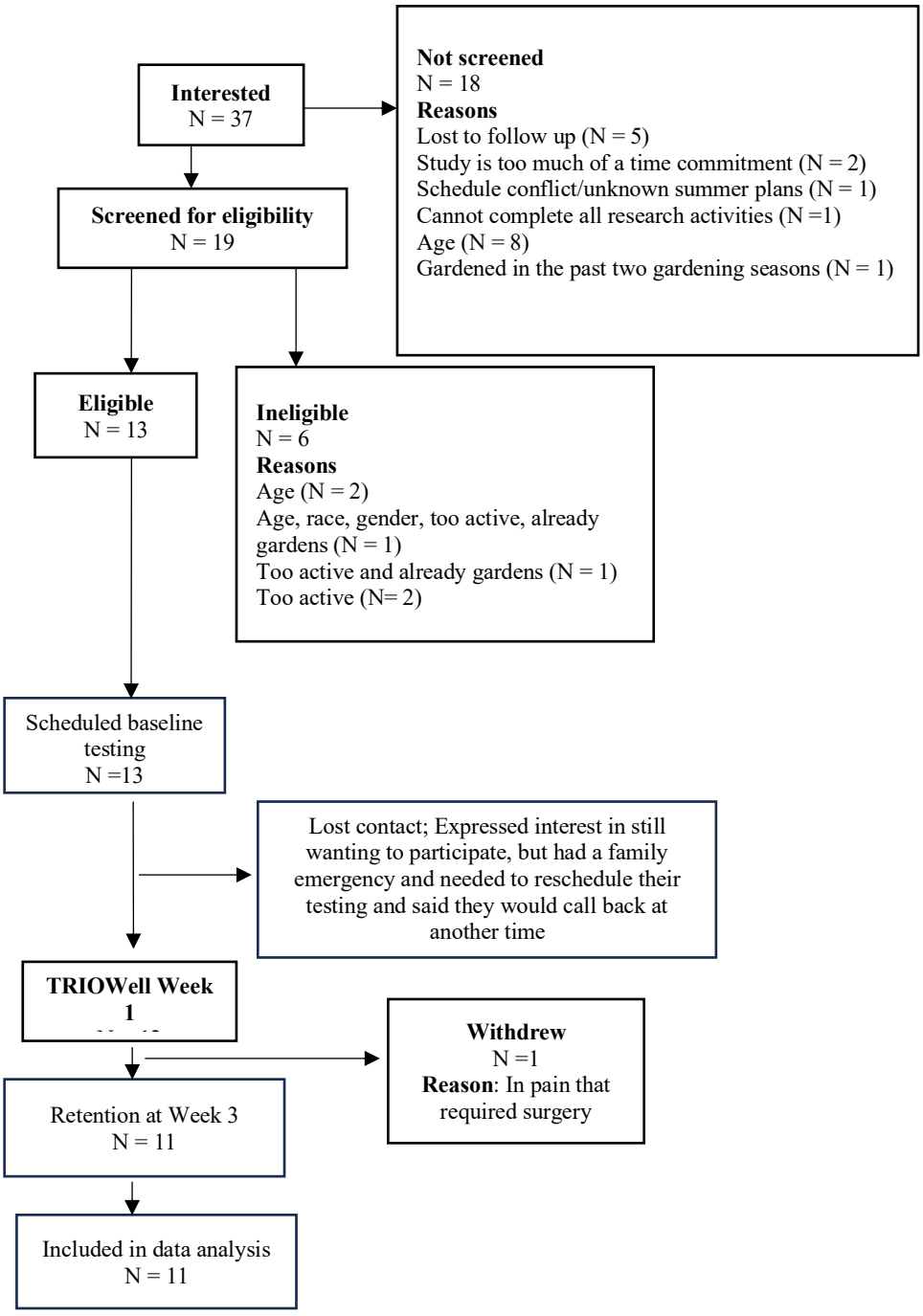

Figure 1. CONSORT (Consolidated Standards of Reporting Trials) Diagram Explaining Participant Flow.

Table 4. Device Assessed and Self-Report Physical Activity Pre-Post Outcomes.

Variables	Baseline (n=7) Mean (SD)	Median (range)	Post-Intervention (n=7) Mean (SD)	Median (range)	P value	Effect Size[1]
Fitbit Charge 3 PA (minutes per day)						
LPA[2]	212.42 (63.70)	209.45 (149.10-274.55)	230.96 (65.97)	233.94 (173.75-290.33)	0.063	0.45
MVPA[3]	7.35 (5.21)	8.20 (2.60-11.87)	5.74 (6.70)	4.75 (0-9.69)	0.499	-0.16
Total PA	219.77 (65.06)	213.65 (152.17-281.52)	236.70 (70.42)	243.63 (173.75-290.33)	0.237	0.29
Steps (per day)	5093.16 (1752.14)	4938.91 (3544.79-6369.21)	5897.71 (2347.18)	5819.38 (4177.25-6101.29)	0.028*	0.53
Self-reported PA (MET-hours per week)	Baseline (n=9)		Post-Intervention (n=11)			
	Mean (SD)	Median (range)	Mean (SD)	Median (range)	P value	Effect Size
Leisure	11.08 (8.54)	8.65 (3.8-16.82)	12.30 (9.94)	7.6 (4.85-18.10)	0.441	0.17
Work	34.55 (47.34)					
Total	45.62 (8.54)	43.19 (38.34-51.36)	46.85 (50.51)	42.14 (39.39-52.64)	0.441	0.17

*p <.05
[1]r, effect size estimate
[2]LPA = light physical activity
[3]MVPA = moderate-to-vigorous physical activity

Secondary Outcomes

Gardening Activity Intensity

According to participant's average heart rates, all gardening activities (i.e., tilling, planting, pruning, weeding, watering, mulching, and harvesting) were categorized as a moderate intensity. Participants rated tilling, planting, pruning, watering, mulching, and harvesting as an RPE rating of "comfortable" and weeding was categorized as an RPE rating of "somewhat difficult." Table 5 displays gardening intensity outcomes.

Table 5. Gardening Activities Intensities.

Activity	HR[1], M(SD) bpm	Intensity[2]	RPE[3], M(SD)	RPE Description
Tilling	106.54 (18.39)	Moderate	4.46 (1.56)	Comfortable
Planting	102.27 (15.13)	Moderate	4.18 (1.25)	Comfortable
Pruning	95.6 (12.61)	Moderate	3.56 (0.53)	Comfortable/ Somewhat
Weeding	102.67 (22.92)	Moderate	4.58 (1.93)	Difficult
Watering	95.75 (9.35)	Moderate	3.85 (1.14)	Comfortable
Mulching	108.07 (15.51)	Moderate	4.41 (1.30)	Comfortable
Harvesting	103.97 (12.56)	Moderate	3.85 (1.14)	Comfortable

[1]HR = Heart Rate
[2]Intensity based off American Heart Association average heart rates by age (American Heart Association, 2021).
[3]RPE = Rate of Perceived Exertion.

FV Consumption

FV intake had an 82-unit median score increase from 140 units at baseline to 222 units at 8-weeks (r = 0.51; *P*=.016). Effect sizes indicate that there was a small increase in self-reported green leafy vegetable consumption (r = 0.25). No pre-and postintervention changes were observed for self-reported consumption of other vegetables (r = 0, P =1) nor berries (r = 0, P =1). Table 6 displays FV consumption outcomes.

Table 6. Device Assessed and Self-Reported Fruit and Vegetable Pre-Post Consumption. (n=11)

Variables	Baseline		Post-Intervention			
	Mean (SD)	Median (range)	Mean (SD)	Median (range)	P value	Effect Size[1]
FV Consumption						
Veggie Meter® (units)	182.51 (93.26)	140.33 (108.00-201.67)	251.85 (70.78)	222.33 (201.67-314.00)	0.016*	0.51
Self-reported (MIND Diet Suboptimal Subsection Scores)						
Green Leafy Vegetables	0.41 (0.38)	0.50 (0-0.50)	0.50 (0.32)	0.50 (0.50)	0.414	0.25
Other Vegetables	0.36 (0.45)	0 (0-1)	0.36 (0.51)	0 (0-1)	1	0
Berries	0.50 (0.32)	0.50 (0.50)	0.50 (0.32)	0.50 (0.50)	1	0

[1]r, effect size estimate
*p < 0.5

Discussion

We hypothesized that a culturally tailored community gardening intervention would be a feasible approach to increase total daily PA levels among middle-aged AA women. We also hypothesized that the intensity of the gardening activities would vary between light, moderate, and vigorous intensities and that TRIOWell would be a feasible approach to increase FV consumption. Our hypotheses were somewhat supported, where there were increases in PA (i,e., step-count), gardening was categorized as a moderate-intensity PA, and FV consumption increased. Furthermore, sixty-seven percent of participants (6/9) indicated that they would recommend this program to family or friends and post-intervention feedback from participants

indicated generally enjoying the intervention, but also provided suggestions of improvement in several areas.

To the best of our knowledge, this is the first community-gardening intervention that targets AA women, as well as the first PA-related intervention to include BHK as a mode of culturally-tailoring. Our findings are somewhat corroborated by other gardening studies, as well as by other culturally tailored PA interventions that target AA women. To date, one community gardening intervention has been published (Litt et al., 2023). Litt and colleagues (2023) conducted an observer-blind, randomized control trial (The Community Activation for Prevention Study [CAPS]) of a diverse adult population in terms of age, ethnicity, and socioeconomic status in a 1-year community gardening intervention and found that participants randomized to the community gardening group compared to the control group increased their fiber intake by 1.41 g per day and moderate-to-vigorous PA levels by 5.8 min per day. TRIOWell participants increased their median Veggie Meter® assessed scores by 82-units [each 100 units of the Veggie Meter® score corresponds to approximately one serving (cup) of FV consumed per day] (Di Noia & Gellermann, 2021) and reported a small increase in green leafy vegetable consumption.

This finding suggests a potential increase in fiber intake amongst TRIOWell participants, given that FV contain fiber (Litt et al., 2023). FV consumption was specifically measured in CAPS, but there were no changes. Interestingly, TRIOWell nor CAPS directly targeted FV consumption, which may be why there were null findings for CAPS, as well as for null findings for self-report berries and other vegetables consumption in TRIOWell. It is plausible that the Veggie Meter® scores (participants can view their scores during measurement and the scale is colorful) served as a form of self-monitoring, goal-setting, and self-regulation for TRIOWell

participants, suggesting that interventions may not require direct diet counseling to elicit change in diet and that providing devices to self-monitor behavior may be adequate. Additionally, the community gardens may have provided more accessibility to FV, which may have also contributed to increases in consumption. Accessibility to FV and food security are directly related to structural racism, where racialized economic segregation causes the disproportionate placement of Black communities in areas that are far from grocery stores (Bailey et al., 2017) and thus is a structural barrier to adequate FV consumption. While only one TRIOWell participant was classified as food insecure, this finding still holds important public health and health equity implications because it suggests that place-based equity initiatives, like the implementation of community gardens, may be effective in providing people with food insecurity access to fresh FV. Additional built environment measures (i.e., walkability and recreational sites) which are also linked to structural racism, should be included in future studies to assess community gardening's potential role in addressing these problems.

In contrast to CAPS moderate-to-vigorous PA findings, moderate-to-vigorous PA levels in TRIOWell showed a small negative effect. During the intervention, we encouraged engagement in all domains of PA (i.e., transportation, household), many of which fall outside of moderate-to-vigorous PA. Participants were only engaging in 7-8 minutes of moderate-to-vigorous PA per day at baseline, so it may have required intentional programming with the goal of increasing their moderate-to-vigorous PA engagement to see increases. Nonetheless, TRIOWell participants not only experienced a small increase in total daily PA, which supports our hypothesis, but they also increased their daily step count and had small increases in light PA. A recent meta-analysis demonstrated that an increase of 500 steps per day is associated with a 7% decrease in cardiovascular disease mortality (Banach et al., 2023), which signifies that

TRIOWell also had clinically significant outcomes. Participating in gardening 2-hours per week likely contributed to their increases in PA, but our emphasis on the benefits of participating in various forms and intensities of PA rather than focusing solely on the benefits of traditional forms of exercise may have translated to participants intentionally engaging in other forms of PA (i.e., transportation, household) outside of the intervention sessions. Our light PA findings are significant to note because of the recent interest in investigating light PA health benefits among adults (Erlenbach et al., 2021; Gothe et al., 2020). Furthermore, these findings suggest that non-traditional forms of movement may be efficacious approaches to increase PA among physically inactive populations. While very small effects, both self-reported leisure and total PA increased, further suggesting that our approach to PA messaging may have been effective.

Fitbit measures of heart rate indicated that gardening activities fell within the moderate-intensity category and that participants rated all gardening activities except for weeding as "comfortable," while they rated weeding as "somewhat difficult." This finding somewhat supported our hypothesis, where activities were categorized as moderate intensity, but none of the activities were categorized as either light or vigorous intensity. There is a dearth of research on gardening activity intensity amongst a wide range of age groups and this is important to note because intensity may differ by age group and fitness levels (Norton et al., 2010). The current gardening intensity data largely reflects findings from older adults (S. A. Park et al., 2008; S.-A. Park et al., 2011, 2012), though Park and colleagues (2014) conducted a study of 10 gardening tasks for men and women in their 20s. The participants completed five gardening tasks randomly ordered and did each task for 5 minutes and rested in a chair for 5 minutes before starting a new gardening task. Each participant wore a portable telemetric calorimeter and breathed into a facemask during the gardening periods and rest periods to assess oxygen uptake. They also wore

a heart rate monitor around their chest (Polar T31) during the gardening tasks and rest periods. Findings from this study indicated that the gardening tasks were moderate-to-high intensity according to metabolic equivalents, also known as METs, which is the amount of oxygen consumed while sitting at rest and serves as the physiological measure of energy cost for a type of physical activity (Jetté et al., 1990), amongst adults in their 20s.

Their findings suggest that gardening could be promoted as exercise to meet PA guidelines among younger adults. Similarly, TRIOWell demonstrated that gardening activities are a moderate-intensity activity, though none of the activities were categorized as vigorous. This difference in our findings may be due to Park et al., (2014) using a wider range of objective indices of intensity. Nonetheless, gardening may still be an effective modality for low-active, middle-aged women to meet PA guidelines. Although TRIOWell did not measure oxygen uptake to further validate intensity levels, the findings encourage continued research on gardening as a form of PA. Wearables as a method to measure heart rate requires more research to examine why certain tools are more accurate than others (Muggeridge et al., 2021) and given that Fitbits are more practical, as well as likely more familiar to participants than chest worn heart rate monitors like the Polar T31, research should focus on improving their accuracy. In addition to utilizing objective measures of intensity, incorporating self-reported methods of determining intensity (I.e., RPE) may also be beneficial to researchers, practitioners, and participants, as it is a simple, cost-effective method to estimate intensity for exercise program design and it provides individuals with a tool to determine their desired PA effort (Borg, 1982).

Including BHK was a novel approach to culturally-tailor a PA intervention among middle-aged AA women and it may have positively contributed to the findings, though future studies would need to refine some components. Traditionally, culturally-tailored PA

interventions that have targeted AA women have included social support in the form of group-based PA and group discussion (Adams et al., 2015; Joseph et al., 2015), faith-based/placed components, like interventions at the church and inclusion of prayer (Duru et al., 2010), and inclusion of electronic and mobile health (Joseph et al., 2019). In a systematic review of 13 PA interventions for AA women, walking, social support, and healthy diet were significant strategies to promote PA in AA women, where seven of the studies increased PA among AA women and two demonstrated increases in FV consumption (Bland & Sharma, 2017), which aligns with TRIOWell findings and underscores the importance of including components that are salient to AA women.

Some women reported not seeing the connection between learning BHK and making health behavior changes. Suggestions to make the connection stronger included teaching about Black personal trainers or demonstrating exercises that correlated with movements specific to gardening. Additionally, the educational components could have focused on Black people's historical contributions to gardening techniques and provided exercise demonstrations that build muscular and cardiovascular strength and endurance that is necessary for gardening. Despite the feedback, 100% (9/9) women said that they enjoyed the historical connections, 77.8% (7/9) felt that it could be used in future health and wellness programming to increase PA, and 66.7% (6/9) of participants said that they would recommend this program to family/friends. This suggests that incorporating BHK has merit, but some changes should be made to its delivery before implementing another study. One change may include a community-based participatory research (Wallerstein & Duran, 2006) approach to the BHK component by conducting formative qualitative research to determine topics in which participants may be interested and then develop a curriculum with historians, educators, and community partners. This approach is collaborative

and equitably involves community members, researchers, and stakeholders, which may effectively enhance the BHK component for a future study.

Adherence to the program was relatively low, which could suggest low feasibility, but holding intervention days on a Saturday yielded higher attendance than holding the intervention on a weekday and participants attended more gardening sessions than education sessions, suggesting that the participants enjoyed gardening. Additionally, the study took place during the summer, so one participant went on vacation for a few weeks during the study. Unfortunately, five women lost family members or friends during the duration of the study, one participant had a planned surgery, but suffered a stroke in response to the surgery, one participant got a new job, and it rearranged her schedule, one participant commuted 45-minutes to make it to the Saturday sessions, and two participants had inconsistent means of transportation. These factors contributed significantly to attendance, many of which were due to unforeseen circumstances. Despite these challenges, retention was at 63.6%, though 100% of participants completed the post-intervention surveys. This was largely due to research staff conducting the surveys face-to-face with the participants. Reasons participants did not provide post-intervention Fitbit data include no longer wanting to participate, the Fitbit causing a rash, and not liking biological data being tracked.

Limitations of the study include the small sample size and lack of a control group. However, the design of the study was appropriate for a feasibility study (Schweizer et al., 2016). Additionally, the length of the study was another limitation. The study was only 8-weeks in duration. This duration may be too short to find meaningful changes in total daily PA outcomes, so future interventions should extend past 8-weeks in duration. Additionally, there were no strategies in place to maintain the program throughout the remainder of the gardening season without the presence of the research team. Conducting a health promotion program for the sole

purpose of research among marginalized populations may perpetuate health disparities, so researchers should prioritize the development of sustainable programming. Strategies researchers may consider is training and compensating a current TRIOWell participant or program leader (not associated with the research team) to lead future iterations or partnering with a community health worker. Lastly, a V02 max test was not performed to determine personal maximum heart rates and thus PA intensity was based off average heart rate estimates by age. Future studies should utilize a wide range of PA intensity measures among middle-aged AA women to better estimate gardening activity intensities and thus can better inform PA recommendations.

The present study had many strengths, including this being the first culturally tailored community gardening intervention targeting middle-aged AA women, as well as the first PA intervention to utilize BHK as a cultural tailoring mechanism. Second, the study included a blend of device-assessed and self-reported PA and FV consumption measures. Third, the intervention leveraged existing green spaces and built connections with existing community organizations to implement the study. Lastly, the use of cultural tailoring and behavioral theory to guide the intervention design enhances the saliency (Resnicow et al., 1999) and may increase effectiveness (Michie & Abraham, 2004).

Conclusion

A culturally tailored community gardening intervention may be a feasible approach to increase daily step count among middle-aged AA women. It may be a moderate intensity PA and may also be a feasible approach to increase device assessed FV consumption. Researchers may consider embedding BHK into other PA interventions to make it more culturally salient. However, adjustments should be made, including ensuring that there are explicit connections between BHK and PA behavior. Community gardening was acceptable to AA women, so future

interventions consider examining alternative approaches to traditional forms of exercise as a strategy to increase their PA levels. Future interventions may also include recipes for FV that were harvested during the intervention, as it is evident that FV consumption was a significant finding of the study. Lastly, community gardening as an intervention may be an effective approach to increase health equity because of its ability to target multiple levels of influence on healthy behaviors, such as providing local spaces to be active, providing opportunity to partner with existing community-based organizations, increasing food access and security, and increasing access to green, natural spaces.

Chapter 3: A Culturally Tailored, Community Gardening Approach to Improving Psychological Health Among Middle-Aged African American Women

Abstract

Background: Examine the feasibility of an 8-week culturally tailored community-gardening intervention to improve psychological health among middle-aged African American (AA) women. **Methods:** Eleven insufficiently active AA women between the ages of 45-64 years who had not gardened in the past two gardening seasons participated in a single group pre-posttest feasibility study. The intervention consisted of twice weekly, 1-hour gardening sessions and 30-minute educational workshops. The educational workshops included a novel approach to cultural tailoring by embedding Black history knowledge (BHK) within the context of community gardening. Feasibility was assessed using a postintervention survey. Psychological health (wellbeing: self-efficacy, meaning and purpose, and general life satisfaction; distress: perceived stress, depression, and anxiety) and PA (Fitbit Charge 3) were assessed at baseline and postintervention. Wilcoxon signed rank tests examined changes in pre-post measures. Effect size estimates were calculated using, *r*. **Results:** There was a small negative effect on perceived stress (r = -0.25) and a small negative effect on self-efficacy (r = -0.35). There were no effects on anxiety nor life satisfaction. Sixty-seven percent (6/9) of women indicated that they would recommend this program to family/friends. **Conclusions:** A culturally tailored, community-gardening intervention may be a feasible approach to decrease stress among AA women, but future studies should be longer in duration, adequately powered, and specifically target self-efficacy. Additionally, before larger scale implementation, the BHK components should be modified.

Keywords: community-based research, mental health, chronic disease, health disparities

Introduction

There has been low representation of minoritized populations in mental health related research (Suinn & Borrayo, 2008), despite evidence indicating that African American (AA) women experience higher chronicity in depression and anxiety when compared to non-Hispanic white women (Asnaani et al., 2010; Williams et al., 2007). Discrimination, juggling multiple demands from a variety of roles (i.e. spousal, parental, communal), financial (D. R. Young et al., 2004), and occupational stress (Elliott Brown et al., 2000) are many stressors that uniquely impact AA women. Simons and colleagues (2021) found that chronic exposure to discrimination predicts inflammation, and as a result, predicts the number of chronic diseases among mid-life AA women. Even less research has been conducted on positive psychological well-being amongst AA women (Mattis et al., 2016).

Psychological distress refers to non-specific symptoms of stress, anxiety, and depression and high levels of psychological distress are indicative of impaired mental health (Cuijpers et al., 2009); positive psychological well-being refers to positive thoughts and feelings such as purpose in life, optimism, and happiness (Kubzansky et al., 2018). High levels of psychological distress are associated with increased mortality risk (Barry et al., 2020) and positive psychological well-being predicts better cardiovascular health outcomes (Kubzansky et al., 2018). Within public health, there has been a paradigm shift to not only examine an absence of negative states, but to also examine protective psychological assets (Hernandez et al., 2018). This shift may be particularly important when targeting AA populations, given that much of the research overwhelmingly labels AAs as “high risk” for many health outcomes. However, there may be unique cultural assets that contribute to positive psychology that could be leveraged in health interventions and thus may be protective of chronic disease (Mattis et al., 2016). As such, there is

a need for the development and implementation of novel, multi-level, evidence-based interventions to eliminate mental health disparities and achieve health equity amongst AA women.

Community gardening may be an effective approach to improve psychological health amongst AA women. The overwhelming majority of gardening data comes from qualitative and cross-sectional studies and they show that compared to non-gardeners, gardeners report feelings of positive mental well-being (Armstrong, 2000; Koay & Dillon, 2020; Van Den Berg et al., 2010; Wakefield et al., 2007). Although, a recent randomized-control study found that participants in the community-gardening group had decreases in stress and anxiety (Litt et al., 2023). Improvements in mental health through community gardening may occur via synergistic effects of physical activity (PA) engagement, fruit and vegetable consumption, being in nature, opportunities to develop neighborhoods and communities, and opportunities to build social capital (Alaimo et al., 2016). A community gardening intervention may specifically appeal to AA women because it is a community engaged activity; collectivism and kinship/social relationships are vital cultural components for many AA women (Joseph, Keller, et al., 2017). Additionally, social support is a primary predictor and motivator of PA participation among AA women (Ainsworth, 2003; Fleury & Lee, 2006; Wilcox et al., 2003). The overall lighter intensity of gardening may also better appeal to AA women, as qualitative studies demonstrate that AA women often report preferences for walking, dance, and yoga/stretching instead of higher-intensity, traditional exercise like going to the gym to run and lifting weights (Bopp et al., 2007; Gothe & Kendall, 2016). Evidence also indicates cognitive health benefits from light PA participation (Canton et al., 2024; Erlenbach et al., 2021; Gothe, 2018), so it is plausible that the PA during community gardening may contribute to psychological health.

There is also a consensus that health promotion interventions targeting marginalized populations should be culturally relevant to increase its cultural saliency (Litt et al., 2023). Embedding a culturally, historically relevant educational component, known as "Black History Knowledge," (BHK) to a community gardening intervention may increase cultural saliency and further enhance psychological health outcomes. In Black Psychology, a construct called "Black History Knowledge (BHK)" is defined by contemporary scholars as "a chronicling of the collective historical and present-day experiences of Black people in America" (Adams, 2005). Since the 1800s, scholars like Dr. Carter G. Woodson and W E. B. DuBois, have justified the significance of history for the advancement of Black people (Chapman-Hilliard & Adams-Bass, 2016). Charles Seifert, a Black historian and author, coined the quote, "a people without knowledge of their past history, origin, and culture is like a tree without roots" (Seifert, 1938) and largely used by the leader of the Pan-Africanism movement, Marcus Garvey, which suggests that knowledge of our backgrounds is necessary for our development and well-being. Several scholars offer that this construct is a significant psychological strength that guides mental health for Black people, as they face racial injustices (Adams, 2005; Thompson & Alfred, 2009). Chapman-Hilliard and Adams-Bass (2016), propose the BHK model of coping and mental health, where they predict that those with a higher level of BHK will have a lower negative impact on their mental health when faced with stressors, like racial injustice.

It is important to recognize that while the term "psychological well-being" is often used within health promotion research to also capture features of psychological distress, psychological well-being and distress are two separate constructs; an absence of psychological distress does not necessarily equate to an increase in psychological well-being (Hernandez et al., 2018). Additionally, one may feel distressed, but still experience life satisfaction. As such, we will use

the general term “psychological health” to represent measures of both psychological distress and well-being.

The purpose of this study is to examine the feasibility of “Tending to Our Roots to Increase Our Wellness” (TRIOWell), an 8-week culturally tailored community gardening intervention to improve psychological health among middle-aged AA women. We hypothesized that TRIOWell would be a feasible approach to improve psychological health among middle-aged AA women.

Methods

TRIOWell was a one group pre-posttest quasi-experimental study. It can be used with small sample sizes and is an effective design for feasibility studies (Schweizer et al., 2016). The study was approved by the University of Illinois Urbana Champaign Institutional Review Board. All participants provided written consent prior to data collection. Participants were free to withdraw at any point of the study.

Participants and Recruitment

Inclusion criteria for the participants included: 1) Self-identify as African American and female, 2) 45-64 years, 3) not have gardened in the past two gardening seasons, 4) <3 days or <90 minutes of moderate-to-vigorous physical activity per week, and 5) access to a smartphone, laptop, and/or tablet. Exclusion criteria included: 1) use of walking aids (cane, walker, wheelchair) and 2) ineligibility according to the Exercise Assessment and Screening for You (EASY) assessment (Chodzko-Zajko et al., 2012).

Approximately one year prior to recruitment, research staff developed rapport with a local church, local gardeners, and park district directors. The team attended regular meetings with gardeners and directors, as well as attended church services and Bible study sessions.

Recruitment took place between May and July 2023, and we aimed to recruit 15 women. Participants were recruited via in-person and media-based approaches, including churches, community events (i.e., local Juneteenth celebrations, local live music events), the University of Illinois Urbana Champaign Black Faculty and Professionals Alliance newsletter announcement, the University of Illinois Urbana Champaign e-Week, and word of mouth. Those who were interested gave their contact information to a member of the research team and were contacted by the team to be screened for study eligibility.

Testing

The baseline assessments lasted for 1-hour in duration and consisted of questionnaires, demographics, vitals (i.e., resting heart rate and blood pressure), and anthropometric measures (weight and height). Participants also received their Fitbit Charge 3 and were provided with personalized e-mail addresses and passwords made by research assistants to create a Fitbit account to use the Fitbit app; the Fitbit app was downloaded to their cell phones during the baseline assessment (all participants had either iOS Apple or Android cell phone). They were provided with a brief orientation and instruction packet to learn how to use the Fitbit and the app. Participants were instructed to wear the Fitbit as soon as they received it during baseline assessment and for the duration of the study, including when not gardening (total of approximately 11-weeks). After participants completed their baseline assessments and received their Fitbits, they received $15. Participants also received $15 for completing post-intervention assessments. Additionally, participants who attended more than 80% of sessions were able to keep their Fitbits.

Demographics

We collected demographic variables including, age, marital status, number of children, number of people in the household, caregiver status, educational attainment, and employment status. Food security status was also collected to provide another proxy of socioeconomic status. Self-report health status including sleep time, smoking status, general health rating, and health history were collected.

Major Experiences of Discrimination

We collected discrimination data utilizing the Major Experiences of Discrimination (Abbreviated Version) to understand other potential stressors (Sternthal et al., 2011).

Intervention

TRIOWell was an 8-week culturally tailored, community gardening pre-post feasibility trial. It consisted of educational workshops and gardening. A description of the components is provided below.

Educational Workshops: TRIOWell consisted of a total of 15, twice-weekly, 30-minute educational workshops (group discussions) led by a research staff person. Educational workshops took place on the same day as gardening sessions and took place prior to the gardening sessions. One session during week 5 took place virtually on Zoom due to inclement weather. Educational workshops took place directly before the gardening sessions at two locations: a local church and library meeting room. Topics covered during the workshops included the history of gardening among AA women, addressing barriers to physical activity participation, environmental justice in Black communities, and climate change. The purpose of the workshops was to provide social support and complementary sessions to the gardening sessions via Black History Knowledge (BHK). Previous gardening studies demonstrate that

adding an educational component to the gardening enhances the program (2008) and culturally-tailoring the sessions through BHK would also likely enhance the receptivity of the programming. The curriculum is predetermined, where each day there is a different lesson. We encouraged an open dialogue and discussion at each session, but many sessions included accompanying activities to assist in discussion development (i.e., listening to a podcast, worksheets). Week 8 consisted of a final game and a potluck celebration. The full curriculum can be found in Table 7.

Table 7. Educational Workshops Curriculum.

Week	**Topic**	**Theories/Models**
1.1	a. Getting to know each other b. Introduction to Physical Activity	Social Cognitive Theory- **Knowledge**
1.2	Addressing Barriers to Physical Activity and Utilizing Physical Activity Assets d. What are some current barriers you face to being physically active? e. What is already in our surroundings that can help us become more active? f. How to set achievable PA goals?	Social Cognitive Theory- **Self-efficacy**
2.1	Utilizing Community as Social Support to engage in healthy behaviors c. Think of communities that you are a part of; list them out d. Do you feel that they support you in becoming physically active?	Social Cognitive Theory- **Social Support** Socio-ecological Model- **Community Level**

Table 7 (cont.)

2.2	All about Community Gardening d. Types of Gardens e. When community gardening became popular f. What community gardens are used for	Socio-ecological Model- **Community Level**
3.1	History of African American Women and Gardening c. Which types of food did AA women grow? d. Who benefitted from their gardens?	Black History Knowledge
3.2	Continued History of African American Women and Gardening b. Exploring AA women's relationship with the environment	
4.1	Food Justice/Power c. Food access d. Exploring food and its relationship with the American Civil Rights Movement	Black History Knowledge
4.2	Continued Food Justice/Power b. How has food been used to resist white supremacy?	
5.1	Food Systems b. What makes up a food system?	Socio-ecological model- **Policy Level**
5.2	Food Systems b. What programs/policies are there at the local, state, and/or federal level that address parts of the food system?	
6.1	Climate Change and Health c. What is climate change? d. How does it impact our health?	Socio-ecological Model- **Policy**

Table 7 (cont.)

6.2	Continued Climate Change and Health b. Current programs and policies in place at the local/state/federal levels to combat climate change	
7.1	Environmental Justice c. What is environmental justice? d. Current examples of environmental injustices	Black History Knowledge Socio-ecological Model- **Policy**
7.2	Environmental Activism throughout Black History c. Historical activists, programs, and movements d. Current activists, programs, and movements today	Black History Knowledge

Gardening Intervention: Participants engaged in a total of 15, twice-weekly, 1-hour long gardening sessions led by a horticultural educator, who was a 39-year-old Black woman, from the local community. Gardening sessions took place on the same day as educational workshops and took place directly after the educational workshops. One session during week 5 was rescheduled to the following week due to inclement weather; thus, participants engaged in 3 gardening sessions during week 6. The gardening sessions took place following the education workshops at two community gardens both located in Champaign, Illinois. Participants gardened at one garden site during the week and at the additional gardening site on the weekend. During the gardening sessions, the horticultural educator followed a lesson plan, as well as reminded the women to keep moving as much as possible and to also take breaks as needed. Much of the learning was experiential, where the horticultural educator verbally instructed, while physically demonstrated gardening skills to the participants. In the beginning sessions, participants were

instructed on how to prune and weed, given that these two tasks are central to gardening upkeep. Participants were often split into groups and tasked with different jobs to gain experience in a variety of gardening skills. For example, during the first session, participants pruned tomato bushes, while another group weeded the garden. The groups switched after 20 minutes. Given that we utilized existing community gardening spaces, participants also assisted with other gardeners' work, including watering the plants, and harvesting the produce. The horticultural educator donated the harvested fruits and vegetables to the surrounding community and the participants often took home with them their harvested fruits and vegetables including but not limited to bell peppers, jalapeño peppers, pears, and tomatoes.

Weekly Phone Calls: Participants received weekly phone calls, (but also received emails or texts as after the first week of calls, some women preferred email or text) as reminders for upcoming sessions, to troubleshoot Fitbit concerns, to give reminders to wear the Fitbit as much as possible, and to discuss general PA goals. We also included weekly communication as a form of frequent contact to show a strong sense of caring, which is a recruitment and retention strategy suggested by Staffileno et al., (2006) when working with Black women participants. During conversations, some women were vulnerable (i.e., embarrassed that they only took a certain amount of steps) during the phone calls, for example, and in response, research staff responded with compassion and encouraged participants to continue to make changes no matter how small.

Framework and Theoretical Basis of the Intervention

The intervention was modeled after a theoretical model called, "Amplifying Health Through Community Gardens," (AHTCG) which is designed to link community gardens and health (Alaimo et al., 2016). This theoretical model is informed by many theoretical frameworks, like socio-ecological models, social cognitive and social determinant theories, the relational

nature between people and places, and social capital. Alaimo & colleagues (2016) describe community gardens as a "multi-component, behaviorally based socio-environmental intervention," given that they can affect intrapersonal, interpersonal, and environmental processes, as well as influence health behavior changes, like diet and physical activity, which influence chronic diseases and mental health (Alaimo et al., 2008; Litt et al., 2011). TRIOWell intervention components primarily aligned with the Social Cognitive Theory and the Socioecological Model.

Social Cognitive Theory (SCT) (Bandura, 1986) postulates that human behaviors result from the mutual and changing interactions between personal factors and socio-environmental factors. Socioecological Model (SEM) provides a theoretical framework for understanding the interrelations among a variety of personal and environmental factors in human health and illness (Stokols, 1996). The levels of influence on health behaviors in this framework may include intrapersonal factors, interpersonal interactions, organizational policies and resources, community and geographic resources, structures and systems, and policy factors (Fleury & Lee, 2006). Table 8 provides brief explanations of how the intervention embedded constructs and concepts from these theories.

Table 8. Amplifying Health Through Community Gardens (Social Cognitive Theory and Socio-ecological Model) Constructs and Concepts that Guided the Intervention Components.

Model Components	**Intervention Component**

Intrapersonal Level- involves individual attitudes, knowledge, beliefs, and perceptions that influence a behavior	• Behavioral Capability: knowledge and skill to perform a PA
	  ○ **Education Workshop Topics** addressed:
	  ▪ Definitions of PA and exercise
	  ▪ Different types of PA (i.e., leisure, transportation)
	  ▪ Barriers and assets of PA
	  ○ **Gardening Instruction:**
	  ▪ Horticultural educator led gardening sessions to teach participants how to garden, which is a type of leisure PA
	• Self-efficacy: confidence in oneself to take action and overcome barriers
	  ○ **Education Workshop Topics** addressed:
	  ▪ Barriers and assets of PA topic
	  ▪ Encourage engagement in all types of PA to demonstrate that small changes are enough
	  ○ **Weekly Phone Calls**
	  ▪ Brainstormed ways to overcome barriers to achieve any personal PA goals
	• Self-regulation: ability to manage social, cognitive, and motivational processes to achieve a desired goal
	  ○ **Fitbit Charge 3 and Fitbit App**
	  ▪ Participants utilized the Fitbit and the app to self-monitor and track daily PA (i.e., steps, heart rate)
	  ○ **Education Workshops**
	  ▪ Opportunity to gain social support
	  ○ **Weekly Phone Calls**
	• Outcome Expectations: anticipated outcomes of engaging in PA
	  ○ **Education Workshop Topics**
	  ▪ Outcomes of participating in community gardening and other types of PA
	  • Better mental health
	  • Hypertension management

Table 8 (cont.)

Interpersonal Level- social influence from friends and family and norms within social networks	• Social Support: the perception and actuality that you are cared for, have assistance from other people, and that you are a part of a social network
	  ○ **Education Workshops**
	  ▪ Group-based discussions
	  ▪ Topic on community as social support for PA
	  ▪ Definition of social support
	  ▪ Types of social support
	  ▪ Historical connection draws on the historical relevance of kinship in Black communities
	  ○ **Gardening Sessions**
	  ▪ Communal gardening sessions with participants, horticultural educator, and research staff

Community Level- the influence of settings in which people have social relationships, like schools, workplaces, and neighborhoods	• **Utilization of established locations in communities where participants live**
	  ○ Randolph Street Community Garden- Champaign, IL
	  ○ Doulgass Park Community Garden- Champaign, IL
	  ○ Champaign Public Library Douglass Park Branch- Champaign, IL
	  ○ Champaign Church of the Bretheren- Champaign, IL
	• **Established rapport with staff at the Champaign Park District, volunteers with the Solidarity Gardens, and garden steward at the Randolph Street Community Garden to help promote gardening at their locations as a wellness program**

Cultural Tailoring of TRIOWell

Resnicow's culturally-tailoring framework describes *surface* and *deep-structure* cultural adaptations when designing culturally-sensitive interventions (Resnicow et al., 1999). Surface structure cultural adaptations are the simplest forms of tailoring, where intervention materials are matched to "superficial" characteristics of the targeted population. Deep structure cultural adaptations are more complex and requires a deeper understanding of the cultural, social,

historical, environmental, and psychological factors that influence health behaviors of the targeted population. Surface-level tailoring of TRIOWell included:

- Holding education workshops at a church, given 75% of African Americans identify as Christian (Pew Research Center, 2021)
- Including images of Black women and families in the workshop materials
- Intervention delivery solely by Black women.

Deep-structure tailoring included:

- Fostering social support through group-based discussions during the education workshops since many AA women value close and kinship-like relationships in their lives
- Considering collectivism and highlighting during discussions how staying healthy themselves will allow them to better care for their family and communities
- Embedding BHK throughout the education workshops to foster racial pride

"Black History Knowledge" as a novel approach to culturally tailoring PA interventions

The BHK model is a framework that attempts to illustrate the interrelationships of risk associated with structural and systemic oppression, BHK awareness domains, stress and coping responses, and mental health outcomes because of these relationships. The model is intended to describe these relationships among Black youth, where evidence has indicated that Black youth who have a strong knowledge of their history may better cope with race-related stressors and discrimination (Adams, 2005; Thompson & Alfred, 2009). However, it also has implications for Black people across the lifespan. Research suggests that race-related stress that occurs during youth may have long-lasting psychological effects into adulthood page (Gibbons et al., 2012), so continuing to learn about the vast and unique history of Black people may also be beneficial for

adult Black women. The model centers four BHK awareness domains: 1) awareness of structure of race and racism in the U.S., 2) awareness of contributions and achievements, 3) awareness of capital positioning (social, political, economic), and 4) awareness of cultural strengths that foster empowered action. These domains intend to emphasize strength, resilience, and achievements within Black history versus solely focusing on a deficit-based Black American historical education. We embedded and targeted these domains within the education workshops by including a "Historical Connection" with each topic.

Historical connections were related to the educational workshop topics and the workshop topics were based off fundamental PA and exercise psychology topics (i.e., PA guidelines, social support, self-efficacy), publicly available community gardening lesson plans, and evidence on the multicomponent nature of community gardening (Alaimo et al., 2016), For instance, one educational workshop topic focused on community gardening's impact on physical, mental, and social health. We discussed how data show that being in nature improves mental health, so researchers propose that being in nature while gardening is one potential pathway that community gardening improves mental health. The historical connection for this topic was focused on the *Handbook of the Negro Garden Club of Virginia*, which was a book edited by Dr. H. Hamilton Williams. Dr. Williams was the head of the Horticultural Department at Hampton University, a Historically Black College/University in the early 20th century. It was written by gardening experts and given to Black women for their gardening clubs. We focused on an excerpt from a chapter called, *Gardening as Recreation,* because it draws connections between PA, nature, and mental health. The authors call it a "superlative" recreation given that one is participating in PA outdoors, which benefits the mental health of both the young and the old.

Including this as the historical connection demonstrates that Black women were already engaging with the connection between gardening and health in the early 20th century.

For this historical connection, we consulted with Abra Lee, a Black woman horticulturist who developed a passion to independently research Black Garden history. She founded the social media platform, *Conquer the Soil* (https://www.instagram.com/conquerthesoil/), which raises horticultural awareness through Black garden history and she has also written the book, *Conquer the Soil: Black America and the Untold Stories of Our Country's Gardeners, Farmers, and Growers*. Her expertise was vital because she provided information that is not easily accessible to non-historians.

One of the domains of BHK is awareness of contributions and achievements. Including historical connections that target Black people's contributions demonstrates that Black people have cultures pre-Transatlantic Slave Trade, and we propose that this would contribute positively to the acceptance and salience of TRIOWell, which would translate to improvements in PA and psychological health outcomes. Examples of historical connections from the workshops are available in Appendix B.

Outcomes

Outcomes were assessed using Research Electronic Data Capture [REDCap] (Harris et al., 2009, 2019) hosted at the University of Illinois Urbana Champaign, with a research personnel reading the questionnaires to the participant and marking the responses for the participant. Questionnaires were filled out this way as another approach to build rapport with the participants (Staffileno & Coke, 2006).

Psychological Health Outcomes

Perceived Stress. We assessed perceived stress by using the Perceived Stress Scale-10 (PSS-10), a 10-item assessment (Cohen & Williamson, 1988) designed to measure the degree to which an individual perceives and appraises life events as stressful (Cohen et al., 1983). It is the most widely used psychological instrument for measuring the perception of stress and it is a valid and reliable shortened version of the original 14-item instrument. Questions ask about feelings and thoughts during the last month. In each question, respondents are asked how often they felt a certain way. Scores are summed across all scale items. Scores ranging from 0-13 are considered low stress, 14-26 are considered moderate stress, and 27-40 are considered high perceived stress.

Anxiety. We assessed anxiety using the Patient Reported Outcomes Measurement Information System (PROMIS) Short Form v1.0- Anxiety 8a (Pilkonis et al., 2011). It is an 8-item self-report measure of anxiety symptoms experienced during the past 7 days. It contains a subset of anxiety items from the full PROMIS Anxiety item bank. Participants rate each item on a 5-point scale, indicating how often they experienced an item (1- *"Never"* to 5- *"Always"*). Raw scores were converted to t-scores based on published PROMIS scoring guidelines (PROMIS®, 2024). For most PROMIS measures, a t-score of 50 is the average for the United States general population with a standard deviation of 10. For negatively worded concepts like anxiety, a t-score of 60 is one standard deviation worse than the general population and in contrast a t-score of 40 is one standard deviation better than the general population. Higher scores indicate experiencing anxiety symptoms often.

Depression. We assessed depression PROMIS Short Form v1.0- Depression 8a (Pilkonis et al., 2011). It is an 8-item self-report measure of depression symptoms experienced during the

past 7 days. It contains a subset of depression items from the full PROMIS Depression item bank. Participants rate each item on a 5-point scale, indicating how often they experienced an item (1- *"Never"* to 5- "*Always"*). Raw scores were converted to t-scores based on published PROMIS scoring guidelines. Higher scores indicate experiencing depressive symptoms often.

Self-Efficacy. We assessed self-efficacy by using the Barriers Specific Self-Efficacy Scale (BARSE) (McAuley, 1992) which measures the perception of an individual's confidence to exercise 3 times per week for the next 3 months given potential barriers. For each item, participants indicated their confidence to complete that behavior on a 100-point percentage scale with 10-point increments, ranging from 0% (not at all confident) to 100% (highly confident). Scores are calculated by summing the confidence ratings and dividing by the total number of items in the scale, with a highest possible efficacy score of 100.

Meaning and Purpose. PROMIS Short Form v1.0-Meaning and Purpose 8a (Cella et al., 2007) is an 8-item self-report measure of one's sense of life having purpose and that there are good reasons for living. It contains a subset of meaning and purpose items from the full PROMIS Meaning and Purpose item bank. Participants rate each item on a 5-point scale, indicating to what extent a statement applies to their life (1-"*Not at all"* to 5-"*Very Much"*). Raw scores are converted t-scores based on published PROMIS scoring guidelines. For positively worded concepts like meaning and purpose, a t-score of 60 is one standard deviation better than the general population and in contrast a t-score of 40 is one standard deviation worse than the general population. Higher scores indicate hopefulness, optimism, goal-directedness, and feelings that one's life is worthy.

General Life Satisfaction. PROMIS Short Form v1.0 General Life Satisfaction 5a (Cella et al., 2007) is a 5-item self-report measure that assesses cognitive evaluation of life experiences

and whether one likes his/her life or not. It contains a subset of general life satisfaction items from the full PROMIS General Life Satisfaction item bank. Participants rate each item on a 7-point scale, indicating to what extent they agree or disagree with a statement (1- *"Strongly Disagree"* to 7- *"Strongly Agree"*). Raw scores are converted t-scores based on published PROMIS scoring guidelines. A higher score indicates better overall life satisfaction.

Data Analysis

Descriptive statistics (mean, frequency, percentage) were used to summarize demographic characteristics. Because of the small sample size (n = 11) and not meeting normality assumptions, we conducted non-parametric analyses. Wilcoxon signed-rank tests were used to examine pre- versus post-intervention changes in study outcomes and effect sizes were estimated by calculating, *r*. Statistical significance was set at a P value of < 0.5 as a point of reference because the study was not powered enough to detect significant changes in study outcomes.

Results

Demographics

Participants included in the analysis (n=11) had a mean age of 50.8 (SD 6.4) and a mean BMI of 35.9 (SD 5.2) kg/m^2. One participant did not want their blood pressure and heart rate recorded due to experiencing the "white coat syndrome," and thus if we took their blood pressure, we would likely record an inaccurate reading. They explained that they were already under the care of a physician. Overall, 36.8% (n = 4) were married, 27.3% (n =3) were single, 27.3% (n =3) were separated/divorced, and 9.1% (n =1) were widowed. Additionally, 9.1% (n =1) had a high school diploma/GED, 9.1% (n =1) attended some college, 9.1.% (n=1) had an Associate's degree, 45.5% (n =5) had a Bachelor's degree, 9.1% (n =1) had a Master's degree,

and 18.2% (n =2) had a PhD. The participants were primarily full time employed (n = 7; 63.6%). Table 9 provides a description of participant characteristics.

Overall, 64% (n=7) indicated that they were unfairly fired for a job or denied a promotion, 54.6% (n=6) were unfairly stopped by police, and 27% (n=3) indicated that they were unfairly discouraged to continue education by a teacher and denied a bank loan. Most felt that the discrimination occurred due to their ancestry, race, and/or gender, the incidents occurred at least a year ago, and have occurred in their lifetimes from a range of once to innumerable. Full results can be found in Table 10.

Table 9. Participant Characteristics.

Demographics	n	*M* ± *SD* or %
Age, years	11	50.8 ± 6.4
BMI, kg/m	11	35.9 ± 5.2
Blood Pressure, mm Hg		
Systolic	10	114.8 ± 11.2
Diastolic	10	74.4 ± 5.6
Resting Heart Rate, bpm	10	82.3 ± 14.2
Education		
Bachelor's degree	8	72.8
Employment Status		
Full Time, ≥ 35 hours/week	7	63.6
Marital Status		
Single or Separated/Divorced	6	54.6
Number of Children		
3 or more	6	54.6
People in household		
4 or more	4	36.4
Caregiver (unpaid)	3	27.3
Sleep		
< 7 hours per night	6	54.6
General Health Rating		
Fair or Good	9	81.9
Chronic Condition		
High Blood Pressure	3	27.3
Food Insecure	1	9.1

Table 10. Major Experiences of Discrimination. (n=11)

At any time in your life, have you ever been unfairly fired from a job or been unfairly denied a promotion?	N(%)
Yes	7 (64)
No	4 (36)
For unfair reasons, have you ever not been hired for a job?	
Yes	4 (36)
No	6 (54.5)
I don't know	1 (9)
Have you ever been unfairly stopped, searched, questioned, physically threatened, or abused by the police?	
Yes	6 (54.5)
No	5 (45.4)
Have you ever been unfairly discouraged by a teacher or advisor from continuing your education?	
Yes	3 (27)
No	8 (73)
Have you ever been unfairly prevented from moving into a neighborhood because the landlord or a realtor refused to sell or rent you a house or apartment?	
Yes	2 (18)
No	9 (82)
Have you ever been unfairly denied a bank loan?	
Yes	3 (27)
No	8 (73)
Reasons for these occurrences most cited: Ancestry, Race, and Gender; occurred more than a year ago, and lifetime occurrences ranged from 1 to innumerable	

Psychological Health Outcomes

Effect sizes revealed a small decrease in perceived stress scores (r = -0.25) and a small increase in meaning and purpose (r = 0.15) from pre-to-postintervention. There was a small decrease in depression (r = 0.14) and self-efficacy (r = -0.35). There were no effects on anxiety or life satisfaction.

Table 11. Psychological Health Pre-Post Outcomes. (n=11)

Variables	Baseline Mean (SD)	Median (range)	Post-Intervention Mean (SD)	Median (range)	P value	Effect Size[1]
PSS-10	15.55 (9.96)	16.00 (8.00-21.00)	13.73 (7.91)	16.00 (5.00-19.00)	0.342	-0.2
PROMIS Anxiety	54.62 (2.59)	56.60 (47.00-60.80)	55.65 (2.35)	55.50 (52.00-58.40)	1	0
PROMIS Depression	45.82 (3.72)	46.30 (38.20-51.60)	46.16 (3.42)	45.40 (38.20-51.70)	0.515	-0.14
BARSE	56.82 (24.36)	60.77 (33.85-75.77)	48.57 (22.31)	38.08 (33.92-75.38)	0.1	-0.35
PROMIS Meaning and Purpose	56.53 (3.82)	54.60 (49.20-67.40)	57.46 (3.72)	57.60 (52.50-64.00)	0.484	0.15
PROMIS Life Satisfaction	48.95 (2.86)	47.20 (42.80-56.10)	48.90 (2.98)	49.20 (44.80-56.00)	0.859	0.04

[1]r, effect size estimate

Discussion

We hypothesized that a TRIOWell would be a feasible approach to improve psychological health among middle-aged AA women. Our hypothesis was partially supported where it may be a feasible approach to improve stress, depression, and meaning and purpose. However, anxiety and life satisfaction did not change, and interestingly, self-efficacy decreased. Sixty-seven percent of participants (6/9) indicated that they would recommend this program to family or friends and post-intervention feedback from participants indicated generally enjoying the intervention, but also provided suggestions of improvement in several areas. To the best of our knowledge, this is the first community-gardening intervention that targets AA women using BHK as a mode of culturally-tailoring. Our findings are somewhat corroborated by other gardening studies.

To date, one community gardening intervention has been published (Litt et al., 2023). Litt and colleagues (2023) conducted an observer-blind, randomized control trial (The Community Activation for Prevention Study [CAPS]) of a diverse adult population in terms of age, ethnicity, and socioeconomic status in a 1-year community gardening intervention to examine its effects on PA, diet, and measures of anthropometrics, with stress and anxiety as secondary outcomes. They found that participants randomized to the community gardening group compared to the control group had statistically significant decreases in both stress and anxiety, especially for participants who started with higher levels of both. Effect sizes for TRIOWell indicated a small decrease in stress, but no effect on anxiety.

TRIOWell participants' baseline mean PSS-10 scores indicated moderate stress levels (15.55) and at post-intervention, their mean score (13.73) was bordering low and moderate stress (PSS-10 scoring: 0-13 = low, 14-26 = moderate, and 27-40 = high). Their baseline scores are

comparable to the general US population PSS-10 score of 15.05 (Cohen & Janicki-Deverts, 2012). This, together with TRIOWell findings, suggests that Americans in general are moderately stressed and may benefit from stress reducing interventions, like community gardening. Qualitative and observational studies have shown that gardening can reduce feelings of stress and anxiety amongst vulnerable populations (Dyg et al., 2020). Some contributions to stress amongst TRIOWell participants may include their major experiences of discrimination, particularly their experiences of being denied a promotion or negative interactions with police, which they reported was likely due to their ancestry, race, and gender. Future studies should test community gardening as an effective approach to address unique stressors, like structural racism, amongst AA women.

A meta-analysis of eight community gardening and horticultural studies (Lampert et al., 2021) overwhelmingly demonstrated positive associations between community gardening, well-being, and mental health outcomes, though one study within the meta-analysis found no difference between gardeners and non-gardeners self-reported symptoms of anxiety (Gerber et al., 2017), suggesting that there may be other factors playing a role in the relationship between anxiety and community gardening. Additionally, CAPS was a yearlong study, whereas TRIOWell was an 8-week study, so it is plausible that TRIOWell was too short in duration to detect changes in anxiety and compared to the general population, TRIOWell participants presented higher anxiety scores, so more rigorous intervention targeted at decreasing anxiety is likely needed.

Litt et al's., (2023) randomized control study, like TRIOWell, drew from the AHTCG framework, which posits that community gardens can be multi-component, nature-based interventions that can improve health behaviors and psychological health, both of which are

necessary for chronic disease and mental health disorder prevention. This means community gardening interventions may be holistic approaches to optimizing health because they can target multiple health and well-being correlates like proximity to nature, places to be active, and social connection. TRIOWell was designed to examine if community gardening increases PA behavior among middle-aged AA women, but we also measured psychological health because PA has been shown to improve measures of psychological health and because of the multiple component nature of community gardening. Both CAPS and TRIOWell found increases in PA, so stress improvements could be attributed to changes in PA behavior in conjunction with community gardening. However, these relationships warrant further investigation, and TRIOWell was underpowered to detect statistically significant changes.

In contrast to CAPS, we also measured depression and markers of positive psychological well-being to further capture psychological health. A meta-analysis examining the effects of gardening on health (Soga, Gaston, et al., 2017) demonstrated that gardening may reduce depression, which supports our depression findings. There may be a synergistic effect between PA engagement, being in nature, and social connection that contributes to reduced feelings of depression. More randomized control studies are needed to better understand which components of community gardening are specifically affecting health outcomes. To capture positive psychological well-being, we assessed meaning and purpose, general life satisfaction, and self-efficacy. In a qualitative study of community gardeners in New York City, the gardeners reported that gardening elicits a sense of purpose through their connections with nature and their community (Sonti & Svendsen, 2018). TRIOWell participants experienced small increases in meaning and purpose. We measured meaning and purpose through a survey, so it is unknown exactly what caused the increase; however, we hypothesize that their reasons are like those

expressed by the community gardeners in New York. We did not find a change in general life satisfaction. In a study examining the associations between time spent gardening and mental well-being and life satisfaction among middle-aged and older adults (Fjaestad et al., 2023), spending at least 150 mins per week gardening was associated with higher general life satisfaction. Not only did TRIOWell participants garden for less than 150 minutes per week (i.e., 120 minutes per week), but they also had a lower baseline general life satisfaction score compared to the general adult population. Middle-aged AA women may require extensive intervention to improve their general life satisfaction, so more research is necessary to better understand life satisfaction among this population. Our study also found that self-efficacy decreased. Self-efficacy in relation to gardening has largely been studied among children increasing their self-efficacy to increase their FV consumption (Robinson-O'Brien et al., 2009), so less is known on the ability of participating in a community gardening intervention to increase self-efficacy to engage in PA behaviors when faced with barriers. Bandura (1997) posited that those who lack experience may have unrealistically high levels of self-efficacy for a specific behavior change. TRIOWell participants were low active and had little to no gardening experience, so this may explain their decrease in self-efficacy.

Including BHK was a novel approach to culturally-tailor a community gardening intervention among middle-aged AA women and it may have positively contributed to the findings. Overall, 100% (9/9) participants enjoyed the historical connections and 78% (7/9) enjoyed the education sessions, so this may have enhanced the program outcomes. However, future studies would need to refine some components. To the best of our knowledge, this is the first culturally-tailored community gardening intervention to be conducted, though an evaluation of the impact of a community gardening intervention to promote health on the Navajo Nation is

underway (Ornelas et al., 2017). Although we cannot compare results, they used similar strategies to culturally tailor the intervention, including building rapport between community stakeholders, organizations, and the academic institution, education workshop topics on ancestral/historical gardening norms, and growing culture specific foods. While psychological health is not an outcome of interest, it is possible that the connections made to their culture may positively influence mental health. There have been other culturally tailored health interventions that target Black women's health.

Traditionally, culturally tailored PA interventions that have targeted AA women have included social support in the form of group-based PA and group discussion (Adams et al., 2015; Joseph et al., 2015), faith-based/placed components, like interventions at the church and inclusion of prayer (Duru et al., 2010), and inclusion of electronic and mobile health (Joseph et al., 2015). In a systematic review of 13 PA interventions for AA women, walking, social support, and healthy diet were significant strategies to promote PA in AA women, where seven of the studies increased PA among AA women, which aligns with TRIOWell findings and underscores the importance of including components that are salient to AA women. "Claiming Your Connections" and "Sister Circles" are culturally-relevant group-based approaches to reduce stress, depression, and anxiety among Black women, where conversations incorporate elements of spirituality, race-based experiences, cultural affirmations, and gender role expectations in the home and community (Jones, 2009; Thomas et al., 2016). "Claiming Your Connections" found statistically significant reductions in stress and Thomas et al.,'s (2016) evaluation of Prime Time Sister Circles found reductions in depression. Together, these data show support for cultural tailoring of health interventions for Black women.

Limitations of the study include the small sample size and lack of a control group. However, the design of the study was appropriate for a feasibility study (Schweizer et al., 2016). Additionally, the length of the study was another limitation. The study was only 8-weeks in duration. This duration may be too short to find meaningful changes in psychological health outcomes. Additionally, education workshops were only 30-minutes in duration. This was especially difficult during the weekday sessions because we started promptly after work hours (5:15 pm), so many women often came late to the sessions. Depending on attendance at 5:15 pm (i.e., if only 2 participants were there), some sessions started later than 5:15 pm to wait for others to join, but we still only met until 5:45 pm as to not cut into gardening time nor to keep the women well into the evening. Longer education sessions may have allotted more targeted discussions on mental health topics and how PA and community gardening may positively influence their psychological health. It is also possible that some discussions of racism contributed negatively to their psychological health, though this was not explicitly measured, so this potential outcome should be addressed in future iterations. Future studies may consider meeting once a week on weekends only and increasing the duration of the program to examine changes in psychological health outcomes.

The present study had many strengths, including this being the first culturally tailored community gardening intervention targeting middle-aged AA women utilizing BHK as a cultural tailoring mechanism. Second, the intervention included measures of positive psychological well-being in addition to measures of psychological distress. Third, we leveraged existing green spaces and built connections with existing community organizations to implement the study. Lastly, the use of cultural tailoring and behavioral theory to guide the intervention design

enhances the saliency (Resnicow et al., 1999) and increases effectiveness (Michie & Abraham, 2004), respectively.

Conclusion

A culturally tailored community gardening intervention may improve some measures of psychological health among middle-aged AA women. Researchers may consider embedding BHK into other health-related interventions to make it more culturally salient. However, adjustments should be made, including ensuring that there are explicit connections between BHK, community gardening, PA behavior, and psychological health. Community gardening was acceptable to AA women, so future interventions consider examining alternative approaches to traditional forms of exercise as a strategy to improve their psychological health. Lastly, community gardening as an intervention may be an effective approach to increase health equity because of its ability to target multiple levels of influence on health and healthy behaviors, such as providing local spaces to be active, providing opportunity to partner with existing community-based organizations, and increasing access to green, natural spaces.

Chapter 4: A Qualitative Exploration of Tending to Our Roots to Increase our Wellness: A Community Gardening Intervention

Abstract

Novel, culturally relevant approaches to address physical, mental, and social health disparities amongst African American (AA) women are needed to achieve health equity. Community gardens are promising health equity-promoting interventions because of their potential to influence health and health behaviors through intrapersonal, interpersonal, and community levels of influence. They can address healthy behaviors, like physical activity (PA) and diet, which can influence chronic disease and mental health outcomes. Community gardens can also address social involvement including social connectedness and social capital. Additionally, a *culturally tailored* community gardening intervention with a historically relevant component known as "Black History Knowledge" (BHK) may increase its saliency among AA women and enhance health outcomes. The purpose of this study is to explore perceptions of health and health behaviors, social capital, and the acceptability of BHK as a form of cultural tailoring among middle-aged AA women (n=11) who participated in an 8-week one group pre-post culturally tailored community gardening feasibility intervention. Eleven interviews were conducted through Zoom or over the phone postintervention. Three major themes emerged: 1) Preparing for and actively making behavior changes, 2) Newfound opportunity for community engagement and camaraderie, and 3) Opportunities to reconstruct and enrich: Feedback for intervention components. This study provides useful information for understanding how community gardening interventions may prepare Black women to make health behavior changes, the value of relationships in Black women's lives, and the overall acceptability of the programming, which together is useful for scaling up the intervention.

Keywords: social capital, social connectedness, health behavior, health equity, Black History Knowledge

Introduction

Participation in regular physical activity (PA) is associated with a reduced risk of chronic disease and all-cause mortality (Warburton & Bredin, 2017), as well as better mental health (Bize et al., 2007), with most evidence for reduced risk of anxiety (McDowell et al., 2019) and depression (Schuch et al., 2018). However, most American adults are insufficiently active (Troiano et al., 2008), with African American (AA) women engaging in the lowest levels of PA (Williams et al., 2018). Additionally, compared to non-Hispanic white and Hispanic women, AA women experience higher rates of chronic cardiometabolic diseases like type 2 diabetes and cardiovascular disease and their cardiovascular mortality rate is 2 times higher than non-Hispanic white and Hispanic women (Curtin, 2019). They also experience higher chronicity of anxiety (Breslau et al., 2005) and depression (Williams et al., 2007). Social determinants of health can explain these differences, where structural racism has been identified as a cause of health disparities (Z. D. Bailey et al., 2021).

Researchers have taken culturally relevant approaches to address PA disparities amongst AA women (Bopp et al., 2009; Duru et al., 2010; Joseph et al., 2015, 2021). However, culturally tailored community gardens as a PA intervention have never been conducted amongst AA women. Community gardening may be an effective approach to addressing PA behavior change among AA women. Data show that compared to non-gardeners, gardeners engage in more PA (Sommerfeld et al., 2010; Van Den Berg et al., 2010) and report feelings of positive mental well-being (Armstrong, 2000; Koay & Dillon, 2020; Van Den Berg et al., 2010; Wakefield et al., 2007). Community gardening may specifically appeal to AA women because it is a community

engaged activity; collectivism and kinship/social relationships are vital cultural components for many AA women (Joseph, Keller, et al., 2017). Relatedly, social support is a primary predictor and motivator of PA participation among AA women (Ainsworth, 2003; Fleury & Lee, 2006; Wilcox et al., 2003). Additionally, qualitative studies have investigated social capital with respect to community gardening and these studies demonstrate that community gardens and gardeners may produce, access, and use social capital (Glover, 2004; Glover et al., 2005; Kingsley et al., 2020). This is of interest because some research suggests that social capital may be a determinant of health (Rodgers et al., 2019).

As such, we designed an 8-week culturally tailored community gardening intervention [Tending to Our Roots to Increase Our Wellness (TRIOWell)] for middle-aged AA women. AA women aged 45-64 years engaged in twice-weekly 1-hour long gardening sessions led by a Black woman horticultural educator and 30-minute long education sessions led by a research team member, who is also a Black woman. To culturally tailor the intervention, we embedded "Black History Knowledge" (BHK) into the education component of the intervention. In Black Psychology, a BHK is defined by contemporary scholars as "a chronicling of the collective historical and present-day experiences of Black people in America" (Adams, 2005). Chapman-Hilliard and Adams-Bass (2016), propose the BHK model of coping and mental health, where they predict that those with a higher level of BHK will have a lower negative impact on their mental health when faced with stressors, like racial injustice.

In a previous study, quantitative data demonstrated that TRIOWell may be a feasible approach to increase step count (measured by Fitbit Charge 3), fruit and vegetable consumption, and decrease in stress. Of those who completed postintervention evaluations, 100% indicated that they enjoyed the BHK connections and gardening sessions, 78% felt that BHK could be used in

future PA interventions, and 67% noted that they would recommend the program to family and friends.

Therefore, the purpose of this qualitative study was to gain an in-depth understanding of what the participants felt may have contributed to any changes due to TRIOWell, to understand social capital in the context of TRIOWell participation, and to examine if embedding BHK with respect to community gardening would enhance the saliency of the program and positively influence the outcomes.

Methods

Participants and Recruitment

Inclusion criteria for the participants included: 1) Self-identify as African American and female, 2) 45-64 years, 3) not have gardened in the past two gardening seasons, 4) <3 days or <90 minutes of moderate-to-vigorous physical activity per week, and 5) access to a smartphone, laptop, and/or tablet. Exclusion criteria included: 1) use of walking aids (cane, walker, wheelchair) and 2) ineligibility according to the Exercise Assessment and Screening for You (EASY) assessment (Chodzko-Zajko et al., 2012).

Procedure

Prior to the interview, participants gave verbal consent to be recorded during the interview. Participants received $15 at the completion of the interview. The Institutional Review Board at the University of Illinois Urbana Champaign approved this study. Eleven semi-structured interviews were conducted postintervention. The study lead (an African American woman graduate student) conducted 30-60 minute semi-structured interviews over Zoom or over the phone. The interviewer asked participants their perceptions about their physical, mental, and social health before and after TRIOWell, as well as questions about their health behaviors (i.e., PA and diet), social capital (i.e., understanding their involvement in other organizations, how

they define trust, relationships during TRIOWell), and BHK acceptability. The semi-structured interview guide consisted of 22 questions and 1 additional question at the end for the participants to add anything they felt that they did not get to discuss during the interview. The guide was developed by the study lead and refined with the principal investigator to ensure that it elicited rich data on each topic. The guide can be found in Appendix D.

All interviews were recorded, and transcripts were prepared verbatim. The transcribed texts were entered into Taguette (Rampin & Rampin, 2021), which is a free and open source computer-assisted qualitative data analysis software package. Data was analyzed by thematic analysis using inductive coding to identify emergent themes (Liamputtong & Ezzy, 2005). Two research assistants (both Black women) coded five interviews together and they each coded three interviews separately to reach saturation. The study lead met with both research assistants to have an in-depth conversation of their codes and themes to help develop a finalized codebook.

Results

The characteristics of the participants are shown in Table 12. Three themes emerged from the interviews: 1) Preparing for and actively making behavior changes, 2) Newfound opportunity for community engagement and camaraderie, and 3) Opportunities to reconstruct and enrich: Feedback for intervention components.

Table 12. Participant Characteristics.

Demographics	n	*M* ± *SD* or %
Age, years	11	50.8 ± 6.4
BMI, kg/m	11	35.9 ± 5.2
Blood Pressure, mm Hg		
Systolic	10	114.8 ± 11.2
Diastolic	10	74.4 ± 5.6
Resting Heart Rate, bpm	10	82.3 ± 14.2
Education		
Bachelor's degree	8	72.8
Employment Status		
Full Time, ≥ 35 hours/week	7	63.6
Marital Status		
Single or Separated/Divorced	6	54.6
Number of Children		
3 or more	6	54.6
People in household		
4 or more	4	36.4
Caregiver (unpaid)	3	27.3
Sleep		
< 7 hours per night	6	54.6
General Health Rating		
Fair or Good	9	81.9
Chronic Condition		
High Blood Pressure	3	27.3
Food Insecure	1	9.1

Preparing for and Actively Making Behavior Changes

Though this intervention targeted PA outcomes, diet (i.e., fruit and vegetable consumption) was still examined. Preparing to make diet changes emerged as a theme, so there were two sub-themes under the theme of preparing for and actively making behavior changes: 1) Preparing for and Actively Making Physical Activity Changes and 2) Preparing for and Actively Making Diet Changes.

Preparing for and Actively Making Physical Activity Changes

Eight women mentioned that after participating in TRIOWell, they recognize that they should be more physically active. Intentionality and awareness were brought up in reference to acknowledging that they should be more physically active. For example, one woman said, "I felt like I was up and about more, just an overall kind of feeling better about being out about moving more or being intentional about moving more." Others noted the importance of being active for health and knowing that they need to improve their PA levels. A woman explained that she dug her weights and exercise videos out of the closet and has tried to start her walking tapes again. Another woman said that she would finish working in her yard before the fall by filling in a hole, so she bought some dirt and she planned to pull weeds since she learned how to during the intervention. Of those eight women, three women actively made changes to their physical activity. One woman noted,

> "Before [TRIOWell] it was easy to talk myself out of doing PA and for me PA is usually walking, now is more I'm going for a walk as opposed to talking myself into it. I just got up before work and went for a walk and it was fantastic."

In contrast, two women indicated that they were already actively engaging in PA behavior, one of them noting that TRIOWell reinforced their current behaviors, though she learned that just because she did not engage in her planned walk around the block that steps taken other ways throughout the day still counted towards her PA. One woman did not feel that TRIOWell influenced PA behavior. She felt that the intention of the group was great and that she enjoyed gardening but that there should have been more to encourage her to be physically active outside of the program.

Preparing for and Actively Making Diet Changes

Most women (n=7) recognized the importance of needing to eat more fruits and vegetables. One woman noted that before TRIOWell, she ate vegetables with every meal but that she does not like many fruits, but now the thought is there to make more smoothies. Of those seven women, four women explained that they were actively beginning to make changes to their fruit and vegetable consumption. Two of the four women attributed their changes to seeing their Veggie Meter® scores and being motivated to improve the score. The Veggie Meter® is a portable device that measures skin carotenoid (colorful plant pigments found in fruits and vegetables with light filtering and antioxidant properties that deposit in the skin). One of the women explained that visual cues and trackers are good for her to make changes and she does not like to be "lacking" in some areas of her life, so she started making to-go fruit baggies to snack on during the day. The other woman started juicing the fruits from the garden. She said,

> "The diet was very essential for me because I was having some blood sugar issues….So what I did with the things that we were growing, I juiced. I made juice with those pears, and you know the different vegetables we were growing while buying some other produce……prior to your research, I had been sitting on a very expensive juicer….and I was like well, I guess it's time to use it."

However, one woman felt that she already ate enough fruits and vegetables prior to the program, but that TRIOWell was an "added motivation…..I could be incorporating more greens or something." Similarly, one TRIOWell participant felt that she was already an avid fruit and vegetable eater, but that gardening did improve accessibility and convenience.

Newfound Opportunity for Community Engagement and Camaraderie

In examining social capital in a community gardening context, we asked about the relationships and bonds built within TRIOWell, as well as their pre-existing relationships outside of TRIOWell. Though, many women referenced the social impact of the community garden intervention throughout various parts of the interview.

Participants (n=8) heavily discussed the social impact of this program. Two women expressed that the Covid-19 pandemic negatively influenced their social lives well into current times. One of the two women said that she was likely mildly depressed and that post-pandemic culture, where staying home is more acceptable, did not motivate her to leave her home. However, TRIOWell got her out of the house because she wanted to learn to garden. She said, "I started it [TRIOWell] for one reason [to learn to garden], and it turned out to be more of a blessing than I anticipated." Similarly, many women did not have the expectation for this program to enhance their social lives; one explicitly explained that she joined for herself to gain a new hobby but unexpectedly made a friend in the process. In fact, she and her new friend from the group ended up taking a weekend trip together.

A few women (n=2) had negative expectations with regards to the social aspect. One woman said that she "didn't really trust Black women…I just haven't had real good experiences with, with Black women." Another woman explained,

> "I wasn't looking for friends, I did not expect to. Actually I was afraid I was really interested in the study…….I remember the day before talking to my best friend, I don't know how this is going to go down with all these Black women."

She explained that she learned that other women in the group were also afraid because many of them have had negative experiences with Black women. She thinks stereotypes of Black women (i.e., backstabbing, gossipy, not trustworthy) and reality television shows contribute to these fears, but after participating in TRIOWell, she is grateful for the opportunity and said, "we had never been in just a group of just Black women doing something specific as opposed to church…what you gave us is incredible…" Another woman echoed the lack of space and opportunities for Black women to engage sentiment, explaining that,

> "This place is a…… void of Blackness. Black female identity. Black Community. Black uplifting….there was just a need for people to have a place to lean on each other and just talk it out."

Many women referenced a texting group chat that they started and how in the chat the women shared with each other about events going on in the community, as well as used it to check in on women who may not have showed up to a TRIOWell session or to provide general support. One woman said,

> "That [social impact] wasn't something I had really thought about…….But specifically I didn't think like especially when they decided to do the group text thing…I never could

> have imagined that we would go into doing that and congratulating people on things that they do and supporting people who are going through things in their lives."

For example, one of the women's mothers was passing away, so another woman in the group told her that she needed to get to her mother quickly, so she booked her a flight. A few weeks later when the woman's mother passed and she was checking her phone to see who had called or texted, she "saw that all the ladies in the group donated and cash app'd me and I cried again….they said you family now." Many women found that the group genuinely cared for one another, one woman saying "care and concern and compassion. That's what we got out of this study." One woman explained that she received parenting advice from one of the women about raising teenagers, another woman called it a "sisterhood," and another woman noted that,

> "this group, they're rooting for each other. They're engaged in each other's lives…And I got some people around me who got my back…."

Reasons the women gave for bonds developed during TRIOWell were having commonalities, their age, the group of women being authentic and non-judgmental. One woman said with respect to what she felt about TRIOWell developed the relationships, "Just everybody is there just accepting everybody open, with no judgment." Another woman explained that she went into the program with optimism about developing relationships, but ultimately, she felt that there was nothing specific about TRIOWell that contributed to the relationships; she felt they were bound to form by the mere fact that they would be working together in the garden. Most women (n=8) emphasized the bonding amongst the group and that they felt like they "clicked" or "hit it off."

One woman who did not emphasize the bonding mentioned that their work schedule interfered with attending all sessions and it may have impeded on her ability to develop stronger bonds, but she did feel that there were one or two women that she could call on for help or a favor in the future.

Similarly, many women said that they would help or provide favors for each other in the future (n=8). Three of those eight women gave specific names of people in the group that they would help, with one of the women naming the horticultural educator. She felt that there were people that the horticultural educator knew that she could also benefit from knowing. She said,

> "And it's not so much as the bond that I would like to connect with Heather [the horticultural educator], has more to do with being able to help the community through the activities that she and people that she know are already doing in the neighborhood and in the community…we already went and did two different activities in two different places…So and then I've already met one of her friends who was trying to start up another project….I'm more interested in the networking part of expanding my ability to assist in the community…I think Heather is pretty reliable in her own right. She's interested in what she's doing…. I think I could call her and say hey Miss Heather where I need some information on so and so and such and such or I need to access."

There was hesitancy of some to *ask* for help and three women said the help would have to be context dependent. Two participants mentioned that they don't like asking others for help, one noting even among those whom she considers friends, it is difficult for her to ask for help, but she'd be willing to help anyone because it is just her nature. One woman who said it would have to be context dependent said, "I mean I what kind of favor and why would I choose that

relationship over an established relationship that I have." One woman said she would not rely on any of the women in the future, except for her friend in the group who she knew before joining TRIOWell. She said,

> "I think we're all [TRIOWell participants] at the acquaintance level; that we care about each other's well-being and interested in it…but I don't know that any of us will get on the road…to go make sure that person is fine."

A woman had similar sentiments in terms of how she viewed the relationships. She mentioned that she was shocked that many women felt so comfortable asking for help with people they had just met. She said, "It was an eventful summer for a lot of us in the group. And we got a lot of in the text messages like GO fundmes and things like that, which I found kind of shocking," though she was one of the women who said she would provide help to the women in the future, depending on the context of the help.

We also asked about any negative experiences within the group and how they navigated those negative experiences. Two women felt that one participant was "attention seeking" and had "narcissistic" tendencies and they both emphasized they felt that it was not malintent, but that this person just may be naturally self-centered. They both said that it did not affect their experience because, as an adult, you must still learn to work with people with whom you may not align. Two other women mentioned an incident, though it is not clear if they were speaking about the same incident. One woman said,

> "I'm just remembering one particular day, a statement someone said and it just kind of shut me down because like wow….my child's biracial, my daughter's biracial, and she referred to biracial as something that really hurt me, you know."

She said she kept that incident to herself. Another woman did not give details about the incident she was describing but said, "there was one situation where something was said and and that was resolved so you know, we worked through it…..that individual that I you know we talked it through. " The other women said that there were not any negative experiences, but just with any other groups, there are always those who take on more of a leadership role and those who are quieter. One woman said,

> "I think having those types of personalities [leaders] in the [group] was beneficial too, yeah. Everybody have their own little things that they added and different characters that fit in the group…I've never been that person that's in the front of anything…I'm always in the background, but I try to contribute."

She said some may have even perceived her as not being open because she is quiet. Women did mention that the women they bonded less with may have been because some women were quieter than others and because some women were not consistently at the sessions.

When asked about their pre-existing relationships with people with whom they trust and how they built their trust, responses included through communication, knowing someone for a long time, judging them based off their interactions, having a need, respect, love, and no judgement. When asked about their definitions of an acquaintance, women used words like co-

worker, transactional friendship, source of information, and casual. One woman explained it as, "people that I can have conversations with or go to lunch with but may not necessarily build personal relationships with." We also asked about their involvement in other organizations. Six women indicated that they're a part of a book club, church, Parent and Teacher Association, and community organizations. They joined these organizations because it is related to their career, a way to get closer to their faith, it feels good, and to learn about opportunities for their children. The woman a part of the Parent and Teacher Association said, "But mostly it's just so that I can find out anything that gives my daughter a one up on anything."

Opportunities to Reconstruct and Enrich: Feedback for Intervention Components

Participants included in-depth reviews and feedback on intervention components, namely using BHK as a form of cultural tailoring, the Fitbit Charge 3 to track their PA levels throughout the intervention, and the weekly phone calls (texts or emails as well, depending on their preference). The weekly phone calls served as reminders for upcoming sessions, to talk about any concerns, and to discuss any personal PA-related goals.

Feedback for Utilizing Black History Knowledge as Culturally Tailoring Method

Six women indicated that BHK during the education sessions did not necessarily encourage them to be physically active outside of the program. One woman said, "I tied the educational component directly to working in the garden, so I didn't like Oh I learned about this Black agriculture, I'm going for a walk." She recommended that if there are physical activities that can be directly tied to African Americans, it may work better to make the connection between BHK and PA behavior. Similarly, another woman said she felt that there was a disconnect and gave an example for a change,

> "I think the historical component should lean more towards physical activity in the sense of this is the example like this is a person who created these kinds of stretches…..this person was the first African American female to intertwine African dance with ballet…these are some of the basic moves she did to tone her legs."

She also suggested to provide examples of movements that are common while gardening. Other women made similar suggestions as to provide explicit connections between African Americans being physically active. One woman offered providing information on Black physical trainers. Though, overall, the women enjoyed the historical connections in general. Some popular historical connections that the women remembered were how the Black Panthers had a Free Breakfast program for children to combat hunger and food insecurity, Black gardening clubs, and Black women gardening entrepreneurs. One woman felt that the connections were critical, and she said she is from an agricultural state, but did not know most of the information. One woman said her historical background with gardening encouraged her to join the program because she already knew that Black people have a history in gardening. Another woman said, "That was what I pulled away from the historical part. It's beyond cotton….I used to wear this shirt….It says history, Black people, Black history is beyond slavery." Another woman felt that BHK reminded her of her family's history with farming and it gave her a sense of appreciation while she gardened. Despite some women feeling disconnected between making PA behavior change and BHK, some still felt that it could be added to other PA or health interventions. Suggestions for future programming with BHK included programs that target diabetes and high blood pressure because these are chronic diseases that impact African Americans at large, teaching gardening techniques, as well as youth programming utilizing BHK.

Feedback on Fitbits as a PA Motivator

Many women (n=6) felt that the Fitbits encouraged them to be physically active, with them particularly enjoying the step counting feature. One woman noting, "keeping track of my steps [main benefit of Fitbits] because I did not realize that I was actively engaging in an aerobic activity." Two women said that at first the Fitbit encouraged them to be active, but they did not like their health and biological data being tracked. One woman said,

> "I don't want my bio data going anywhere….I'm just not in the tech like that. You know, biotech is we're crossing a daily line. We really are. You should not know what my body is doing at anytime."

Women also commented on difficulty of wearing the Fitbit. One woman mentioned being unmotivated to wear the Fitbit due to having sensory problems, the Fitbit not being fashionable, and not being used to wearing something on her wrist. Another woman, who made the comment about not wanting her bio data to go anywhere, also mentioned not being used to wearing something electronic on her arm every day and she also developed a rash on her wrist due to the Fitbit. One woman mentioned that it became cumbersome wearing the Fitbit daily and another woman said that she was already wearing her Samsung Watch (she wore both the Samsung Watch and the Fitbit), so the Fitbit was something extra to remember. Though, she preferred the Fitbit for tracking her sleep. Wearing the Fitbit to sleep was not a priority for this study, but we told the participants that they could wear it for their own knowledge. Other participants (n=5) also commented on liking the Fitbit to track their sleeping patterns and a participant who felt that

the Fitbit only somewhat helped her be more active mentioned that she has worn devices in the past to track her sleep (but did not use the Fitbit to track her sleep).

Feedback on Weekly Phone Calls

The weekly phone calls received mixed responses. Two women mentioned that they did not understand the purpose of the phone calls. One woman who did not understand their purpose said,

> "I didn't understand how goal setting played into gardening and that was part of the process…I was kind of caught off guard when I was contacted and I was like, I don't have any goals..I'll try to make it to the gardening thing."

Three women said that the calls were not helpful. One woman explained that the calls were not helpful because they would come when she was doing something. She suggested setting goals in-person during the Saturday sessions and having the women write down their weekly goal(s). Some women explained it as knowing that a call or text was going to come, so it served as motivation and accountability. One woman said, "It's like I know she's gonna text me and ask me about this, so it's I should be looking for those weights." Another woman acknowledged that she did not commit to her PA goals, but that the phone calls were still great prompts. She remembered one phone call in particular.

> "And I remember the one specific phone call was and it was really encouraging to me like a lot. Because it's a, it's a norm that I didn't I didn't know I was doing. Me always going up and down the stairs and the Fitbit.. I was like I'm so sorry. I tried to get to 10K

but I couldn't. You were like you're fine, right? Because I always hear people going around my job like oh, I got to 10K I got the 10K, So I'm like, if I don't get the 10K, then I'm not really being physically active…So just that phone call. I got educated on my physical norms. My active physical norms during the day. So so wearing the Fitbit when I did and having that phone call with you I realized that I can probably walk close to on average at least 2 miles a day."

Discussion

Findings from this study indicated that TRIOWell may place low-active, middle-aged AA women in the preparation stage of making PA level and fruit and vegetable consumption changes, as well as motivate some women to actively make changes. Our findings demonstrate a significant positive impact on the women's social lives, with evidence to suggest that an 8-week community gardening program may increase social capital among middle-aged AA women. Lastly, BHK topics were enjoyed amongst the women, but before scaling up TRIOWell, refinements to its application should be made. Fitbits were accepted by many of the women to increase their PA, but some women experienced barriers to consistently wearing the Fitbits. Weekly phone calls may be an unnecessary PA goal setting tool for an 8-week community gardening intervention.

Though the Transtheoretical Model (Stages of Change) (Prochaska & DiClemente, 1983) was not a framework utilized in the study, it was evident that many of the women fell within the preparation and action stages of change. The preparation stage of change is defined as people knowing that something needs to change and that they are ready to take action in 30 days; people start to take small steps toward the behavior change and they believe changing their behavior can

lead to a healthier life. In the action stage, people have recently changed their behavior (within the last 6-months and the action could be as short as 1-hour in duration) and intend to keep moving forward. Most women acknowledged that they needed to be more intentional about being physically active and eating more fruits and vegetables because they know that it is good for their health. One woman referenced taking her exercise videos and equipment out of the closet, while women had actively made changes such as taking a walk before work, using a new juicer, and making to-go fruit snack packs.

The intervention emphasized all forms of PA (i.e., transportation, household) versus the traditional strategy of emphasizing engagement in only leisure, moderate-intensity forms of PA. The 2018 PA Guidelines for Americans (U.S. Department of Health and Human Services, 2018) note that some PA is better than none. Evidence has demonstrated health benefits at the lightest PA intensities (Canton et al., 2024; Erlenbach et al., 2021; Gothe et al., 2020) and there have been calls for first decreasing sedentary behavior and increasing light PA among inactive populations, as this may be a more feasible approach versus jumping to increases in leisure, moderate-intensity PA (Dogra et al., 2021). It is possible that this messaging positively influenced TRIOWell participants to think about and actively change their PA behaviors. One woman may have demonstrated the effects of this messaging when she mentioned that on the days that she may not have taken her daily walk around the block, she realized that she was still accumulating steps elsewhere throughout the day and that "it counts." Additionally, engaging in gardening two times a week may have increased their confidence to continue to find other ways to be active throughout the week.

Although changes in fruit and vegetable consumption were not a targeted outcome, the data show that the women were thinking about changing their fruit and vegetable intake and

some women actively ate more fruits and vegetables. Some women mentioned the device we used (Veggie Meter®) to measure their intake as a motivating factor for change because they had a visual cue (a number on a colorful scale, with higher numbers indicating eating more fruits and vegetables and green indicating a better score). This suggests that self-tracking modes may be enough for some women to make changes to their fruit and vegetable intake. One woman who felt that her consumption stayed the same said that gardening did increase accessibility and convenience to fruits and vegetables, so it is possible that being in an environment, like a garden, with access to fruits and vegetables influenced other women to actively think about or change their fruit and vegetable consumption. A qualitative study of community gardeners in Toronto also showed that gardeners perceive that community gardens provide improved access to fruits and vegetables (Wakefield et al., 2007).

TRIOWell had a significant impact on the women socially. Though social connection was not an explicit outcome of the intervention, it is vital to capture these findings, especially since the U.S. General Surgeon declared a "loneliness epidemic," much of it exacerbated by the recent Covid-19 pandemic (U.S. Surgeon General Advisory, 2023). Poor or insufficient social connection is associated with a 29% increased risk of heart disease and a 32% increased risk of stroke (Valtorta et al., 2016). Furthermore, it is associated with increased risk for anxiety and depression (Mann et al., 2022). Racial and ethnic minorities may even be at a higher risk of experiencing a lack of social connection (U.S. Surgeon General Advisory, 2023). Our findings demonstrated that some women were negatively impacted by the Covid-19 pandemic, in that they stayed home and stopped participating in as many community activities. However, they joined TRIOWell to integrate back into participating in community activities. Community-based

activities, like community gardens and especially during a transition out of a global pandemic, may be an effective approach to enhance social connection among AA women.

Many women spoke about the group providing general support, encouragement, and camaraderie and some women even made new friends. Two vital components of social connection are the structure and the quality of the connections. The structure of social connection is the number of relationships, variety of relationships, and the frequency of interaction with others. The quality of social connection is the degree to which relationships and interactions are positive, helpful, or satisfying (vs. negative, unhelpful, or unsatisfying) (U.S. Surgeon General Advisory, 2023). Two women in the group likely increased their structure as evidenced by them meeting during TRIOWell and subsequently taking a trip together. There should be strategies to provide opportunities for middle-aged AA women to expand the number of relationships in their lives. It is evident that many of the interactions were positive, as the women initially did not consider the social possibilities of participation, but many were pleasantly surprised when they gained support from other women. The women started their own texting group chat and used it as an additional form of support by posting about events to attend and to provide both emotional and instrumental support, such as using it to donate to women whose family member had passed away. They even told a woman that she is family now, indicating that positive social connections were formed amongst the women.

More specifically to *Black* women, these findings suggest a need for spaces and programming dedicated to Black women to enhance their social lives. One woman described the city as void of Black female identity and this group being necessary for Black women to just "talk it out." Another woman made a criticism in that often the only spaces provided for Black women are through the church, implying that in addition to their needing to be spaces for Black

women, there should also be a variety in the types of Black women friendly spaces. Interestingly, some women spoke about initially being hesitant to join TRIOWell because it would be among a group of only Black women, but at the conclusion of the program, they realized that Black women could engage with one another in a positive manner and that this program was necessary.

Unfortunately, it is not uncommon for some Black women to internalize misogyny, which means [Black] women may subconsciously project sexist ideas unto themselves and other women (Szymanski et al., 2009). Because of patriarchy and sexism, harmful stereotypes about [Black] women exist (i.e., gossipy, backstabbing) and due to their persistence and perpetuation by many institutions, some women begin to believe the stereotypes themselves. This is what likely causes some women to automatically distrust *all* women after *one* bad experience with women. Future interventions may consider including modules on self-identity and worth, to affirm Black women and to reject internalized sexist ideas.

Groups are not without potential negative experiences and when designing community-based programs, it is important to be aware of the possibility of the negative interactions. A few women spoke about personality differences and decided that a woman in the group is not someone with whom they would associate, but it did not hinder their overall experience. Both women explained that as an adult, you must learn how to work with those with whom you may not align, so this is likely why it did not hinder their experience and opportunity to connect with other women. Two other women spoke about negative comments that were made, with one woman explaining more in-depth about the comment being insensitive regarding bi-racial people. She decided not to speak about it with the women, but she acknowledged that the comment hurt her because her child is bi-racial.

Though the specific comment that they made, nor any context of the incident was not shared, there is a plethora of data on experiences of bi-racial people (i.e., mixed Black and another race) to potentially explain why she was hurt. Many bi-racial people feel invalidated, with one study indicating that mixed Black/white participants felt that the primary perpetrator of invalidation came from Black individuals (Franco et al., 2016). Other studies indicate that many bi-racial people don't feel accepted by either race or that there is an expectation for them to "pick" one race (Ferguson, 2016). These interactions display one of many unique experiences within Black communities and these interactions warrant further investigation when developing programming for Black women. Researchers were also not privy to the incidents at the time of their occurrence. This could be due to multiple reasons, like some participants may have felt the problem was not significant enough to bring it to the research teams' attention or they felt they handled the incident adequately on their own. If researchers know about negative experiences soon after they occurred, they should consider incorporating conflict resolution strategies. Researchers may also consider developing ground rules with participants at the start of programming, with the intention of establishing a culture of respect and trust. They should emphasize to participants that they do not have to internalize negative interactions and that problems can be shared with the research team.

We also examined social capital in the context of community gardening. The data demonstrate that TRIOWell may have produced bonding, bridging, and linking social capital. Examples include many of the women donated money to some of the women, one woman bought a plane ticket for another woman, and two of the women took a weekend trip together in another city. These types of interactions require some level of trust, which suggests that bonding social capital was produced. Homophily may also help to explain the formation of their bonds

and the production of social capital. Homophily is a sociological concept that describes the tendency of individuals to associate and bond with similar people (McPherson et al., 2001). Many women felt that they all "just clicked," with some women mentioning that they bonded because of (unspecified) commonalities and because of their age. Some women also specifically mentioned needing spaces for Black women, so it is possible that their sociodemographic identities alone laid the groundwork for their connections. Some research has been conducted to understand the process of "Black homophily," given that much research already focuses on the benefits of cross-racial interactions (Gilkes Borr, 2019), when understanding how and why Black relationships form may also be important because it may inform the design of culturally relevant health promotion programs for Black women.

Though all the women were middle-aged, AA, and women, they varied in education attainment, which may suggest that bridging social capital was also produced. Similarly, one of the participants explained that she is a member of her child's school's Parent-Teacher Association to find out about anything to get her daughter ahead, which signals that bridging social capital may be vital for middle-aged AA women for personal benefits. Linking social capital may have been produced when one of the participants was able to access connections to continue to do more community-based work through the horticultural educator's network. Linking social capital represents trust and norms built between people who are interacting across explicit, formal power or authority figures within an organization (Christensen, 2017). In TRIOWell, the horticultural educator held a leadership position in the intervention, thus representing an authoritative figure. In all, it is possible that an 8-week community gardening intervention can foster the production of social capital among middle-aged AA women and potentially translate positively to the women's health behavior outcomes.

It is also important to note that one woman felt that the women were acquaintances and that while there was care for each other, they still would not ask for nor expect help from the women nor drive a long way to check-in on each other. When asked how the women define acquaintances, they used words like co-worker, transactional friendship, and casual, which suggests that for this participant, an 8-week community gardening intervention with other middle-aged AA women may not be enough to produce bonding social capital. The first educational workshop included an icebreaker, where the woman introduced themselves by telling the group where they are from, where they currently live, something interesting about themselves, and what they wanted to get out of the program. However, this was the only icebreaker included in the intervention. If more explicit activities were included in the intervention for the women to get to know each other better, this may have produced bonding social capital for those who felt less connected with the women.

Similarly, another woman described the relationships as "new" and said that providing help would be context-dependent; she also explicitly stated that she found it shocking that the women would ask each other for donations even though they had all just met. It is plausible that these women and the women who felt similarly to them about the relationships in the group, that making donations to or asking for donations from women you recently met, felt like an obligation. Although it is unknown whether all women donated, it would be reasonable to assume that members would not want to be the only one who did not donate to someone who is going through a hard time, due to social norms and sanctions. Obligations could place strain on members of a group. This is the potential negative side of social capital that is not often considered in the literature, and it was important for us to acknowledge to better understand social capital.

The women indicated that they generally enjoyed learning the historical connections, some noting that it made them appreciate their own family history. Many of the women also indicated that it could be used in future health and PA programs. However, utilizing BHK to influence health behaviors may require refinement before implementation in a future intervention. It appears that the women would have preferred explicit connections between PA and BHK, like providing examples of Black physical trainers or examples of physical activities that AAs have done historically. A future PA intervention that includes BHK may require insight from experts in history and even in education to provide creative strategies to embed historical knowledge.

Fitbits received general acceptance, but future PA interventions may consider offering a variety of forms of PA tracking devices to increase wear time adherence. Given that some women did not want their health data tracked, accelerometers or pedometers may be better approaches. Both have a positive attribute in that neither would have to be connected to an application. Researchers may ask participants to wear the accelerometer just 1-week before and 1-week after the intervention, so this may decrease wear time burden. Pedometers are small and can be easily clipped onto a person. They have been used in many PA interventions amongst AA women (Bland & Sharma, 2017), they are cost effective, and they could be used as an incentive.

However, limitations exist for both accelerometers and pedometers. Accelerometers are primarily used as research grade tools given that the format of the exported PA data cannot be easily interpreted, and they are not fashionable. As such, accelerometers would not be used as an additional incentive opportunity as would pedometers or other wearables. TRIOWell participants, for example, were able to keep their Fitbits if they attended at least 75% of the sessions. The limitation of pedometers is that they only count steps and step counts do not

accurately account for PAs that do not require steps, it does not account for minutes spent in a PA, nor does it estimate PA intensity (Bassett & John, 2010). Another barrier to Fitbits that some women mentioned is that they were already wearing other wearables, so future interventions should inquire about wearables during study enrollment to decide if participants can commit to wearing the intervention designated wearable or researchers may allow the participant to use their personal wearable but be required to share the data with the research team on a regular basis. Interestingly, almost 50% of the women mentioned that they enjoyed the Fitbit for tracking their sleep even if they felt that it did not contribute to PA behavior change. This may suggest that middle-aged AA women are interested in sleep hygiene. In fact, 54.6% of the women indicated that they get less than 7 hours of sleep a night, when the recommendation for middle-aged women is to sleep between 7 and 9 hours per night (AARP, 2017), so PA interventions targeting AA women may consider emphasizing the importance of sleep and its connection with PA.

Weekly phone calls in general proved to be unhelpful to the women. There were multiple purposes of the phone calls, one being staying in contact with the women given that this has been recommended as a culturally-specific retention strategy for AAs (Otado et al., 2015; Staffileno & Coke, 2006) and another for goal-setting. This strategy may depend on the amount of intervention days; TRIOWell met twice a week for an hour and a half, so a phone call between the daily sessions may have been excessive. A text or email could have been sent once every other week to check-in with the participants. Regarding goal setting, clearer communication could have been made to the participants about its purpose, given that two women said they did not understand the purpose of the phone calls and goal setting. The intention of goal setting was to incorporate a mode of progression, given that PA prescriptions should include progression in

programming (Phillips & Kennedy, 2012). This proved to be a bit difficult with community gardening given that the work that needed to be done would vary each session. We also did not want to introduce another PA into the intervention (i.e., walking) because we wanted to examine community gardening only as a PA. As such, we gave the space for the women to provide their own goals. We did not give advice on how to make a goal; it was quite open ended, but whichever goal they picked, we encouraged them to increase from the previous week. This approach may have also contributed to the low adherence and dissatisfaction with the phone calls, so future interventions utilizing community gardening as a form of PA should design ways to progress the PA.

Conclusion

This study provided an in-depth, qualitative investigation of an 8-week culturally tailored community gardening intervention (TRIOWell) among middle-aged AA women. Findings demonstrated that community gardens may be an effective community-based and public health approach to preparing middle-aged AA women to increase their PA levels and fruit and vegetable consumption, as well as influence women to actively make changes. This study highlighted the need for a variety of spaces for Black women to build connections with other Black women to reduce the risk of experiencing a lack of social connections. This may be particularly important after major global events, like a pandemic, where social isolation was required for a period. Academic-community partnerships may consider collaborating to create these socialization spaces for Black women. Future research should investigate the potential health implications of community gardening and the production of social capital among middle-aged AA women. Lastly, BHK is a novel approach to culturally tailoring a community gardening intervention, but historians and educators should be included in the study design and

implementation to ensure that the material is effectively embedded. A variety of PA wearables should be offered to middle-aged AA women who are enrolled in a community gardening intervention to increase wear time adherence. Though, wearables may be acceptable to use to investigate sleep health among middle-aged AA women; this warrants further investigation. Phone calls as a culturally relevant retention method may not be effective among all AA women; other culturally acceptable retention forms should be examined qualitatively. These findings can be used to improve TRIOWell before implementation among a bigger sample, as well as inform the design of future PA-related interventions among AA women.

Chapter 5: Conclusion

The results from the study indicate that a culturally tailored community gardening intervention may be a feasible approach to increase device-assessed step count and FV consumption and decrease stress among middle-aged AA women. Data also suggest that it may have a moderate positive effect on device assessed light PA, and a small effect on device-assessed total daily PA, depression and meaning and purpose, and self-report green leafy vegetable consumption. Though, it may not be a feasible approach to improve self-efficacy, anxiety, life satisfaction, and berry consumption.

Qualitative findings suggested that TRIOWell positively influenced PA behaviors and FV consumption among many women, aligning them with the preparation and action stages of change. Women felt that TRIOWell provided them with unexpected, yet positive social outcomes and findings underscore the need for spaces for AA women to engage in meaningful social connections with other AA women. Similarly, interviews indicated that community gardening may also be a way to produce social capital amongst middle-aged AA women. Furthermore, TRIOWell's intervention components were generally well accepted. Women indicated in their interviews and postintervention evaluations that they enjoyed the education sessions and historical connections, and the Fitbit encouraged many of the women to be physically active through the step tracking feature. Many of the women also used the Fitbit to track their sleep.

These findings have public health implications, where a culturally tailored community gardening intervention may address health disparities affecting AA women. Community gardening as an intervention may be an effective approach to increase health equity because of its ability to target multiple levels of influence on healthy behaviors, such as providing local

spaces to be active, providing opportunity to partner with existing community-based organizations, increasing food access and security, and increasing access to green, natural spaces. Additional cultural tailoring may also increase the program's cultural saliency, which may positively influence health behavior. As such, researchers may consider embedding BHK into future community gardening interventions. However, adjustments should be made, including ensuring that there are explicit connections between BHK and PA behavior, offer a variety of PA wearables, and consider other culturally relevant program retention strategies, as weekly phone calls may not be effective among all AA women. The design and implementation of novel, evidence-based interventions that target health disparities among AA women should be a priority to achieve health equity for all.

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APPENDIX A: Gardening Log

Gardening Log

Date: _____

1) Before the session:

Heart Rate: _____beats per minute (bpm)

RPE: _____ (write the number from the scale below)

2) Mid-Session:

Current activity: _____

Heart Rate: _____beats per minute (bpm)

RPE: _____ (write the number from the scale below)

3) At the end of the session:

Activity just finished doing: _____

Heart Rate: _____beats per minute (bpm)

RPE: _____ (write the number from the scale below)

RPE SCALE

1	Nothing
2	Very Easy
3	Easy
4	Comfortable
5	Somewhat Difficult
6	Difficult
7	Hard
8	Very Hard
9	Extremely Hard
10	Maximal/Exhaustion

APPENDIX B: Education Session Historical Connection Topics

Week	Topic	Historical Connection
1.1	a. Getting to know each other b. Introduction to Physical Activity	Anita J. Turner-first Black female physical educator in the US (1893)
1.2	Addressing Barriers to Physical Activity and Utilizing Physical Activity Assets	The "Black church" was the first institution built for and by Black people. It is a place for political, economic, spiritual, and social refuge Can it also be used as a place to improve our health and increase PA?
2.1	Utilizing Community as Social Support to engage in healthy behaviors	Kinship networks arose out of response to enslavement; 18th and 19th century Black women made quilts to bond with each other, and quilting gave enslaved people time to socialize without supervision How can kinship be applied to engaging in PA?
2.2	All about Community Gardening	"Handbook of the Negro Garden Club"- a book edited by Dr. H. Hamilton Williams for Black women to have at their garden clubs; "Gardening as Recreation" was a chapter discussing the health implications of gardening
3.1	History of African American Women and Gardening	*Entire workshop involves historical content* Gardening was more than just gardening for many early 20th century African American women; it meant self-determination, community, and entrepreneurship
4.1	Food Justice/Power	In the Jim Crow era, land ownership was tied to voting rights, where African American farmers who voted, were evicted by white farmers, which left them with a choice between food/land or political rights
5.1	Food Systems	The Honorable Shirley Chisolm played a major role in the creation of Special

Week	Topic	Historical Connection
		Supplementation Nutrition Program for Women, Infants, and Children (WIC), which served to ensure that low-income women could have access to free, healthy food for their children
6.1	Climate Change and Health	Hazel Johnson founded the People for Community Recovery (1979) to address toxic industrial waste sites surrounding her Chicago neighborhood. She worked with a team to convince President Clinton to sign the Environmental Justice Executive Order (1994)
7.1	Environmental Justice	*Entire workshop involves historical content* North Carolina PCB (Polychlorinated biphenyls) Protest of 1982- the state dumped soil laced with PCB in Warren County, NC; residents (65% African American and 25% of residents lived in poverty) had no say in location of waste dumping sites, so they protested; The National Association for the Advancement of Colored People (NAACP) helped to organize protests that lasted for 6-weeks; it sparked new environmental justice movements led by poor and people of color communities
7.2	Environmental Activism throughout Black History	*Entire workshop involves historical content* "Jesus People Against Pollution" (1992) exposed a Columbia, Mississippi chemical company of their toxic dumping into African American communities; the dumpings resulted in health problems and increased mortality among Black people

APPENDIX C: Evaluation Forms

Evaluation Forms

APPENDIX D: Interview Guide

TRIOWell Interview Guide

Interviewer Script: *Thank you for participating in our study. We really appreciate your commitment to the program. As we close out our study, I have a couple of open-ended questions that I'd like to ask. The questions should give you a chance to expand on the answers you already shared in the surveys, as well as to understand more of your experiences with the education workshops. If it is ok, this is the aspect of the interview we would like to record today so that we can make sure your answers are understood accurately.*

Health Status

1. Before the program, how would you characterize your
    a. Physical Health?
        i. Probe: Poor, Fair, Good, Very Good, Excellent
        ii. Why would you rate your physical health this way?
    b. Mental Health?
        i. Probe: Poor, Fair, Good, Very Good, Excellent
        ii. Why would you rate your mental health this way?
    c. Social Health?
        i. Probe: Were you meeting new people?
        ii. Were you trying new activities?
        iii. Were you nurturing your current relationships?
2. After the program, how would you characterize your physical, mental, and social health?
3. What specifically about the program do you feel contributed to these changes?

Health Behavior

Physical Activity and Diet

1. Before the program, what came to mind when you heard or thought of the phrase "physical activity/exercise."
2. After the program, have these thoughts changed? If so, in what ways?
3. How did using the FitBit affect your physical activity throughout the program?
    a. Do you feel motivated and confident to continue using the FitBit after the program ends? Why or why not?
4. During the education workshops, we discussed physical activity assets, and we did some goal setting phone calls. How have these affected your current physical activity?
5. Tell me about your fruit and vegetable intake before the program.
    a. Probe: About how much fruit were you eating per week?
    b. Which types of fruit/vegetables were you eating and why?
6. Explain how the program influenced your fruit and vegetable intake.
    a. Probe: Do you eat more or less fruits and vegetables now?
    b. Are you more confident in trying different types of fruit and vegetables?
    c. Are you confident in increasing fruit and vegetable intake?

Social Capital

1. Tell me about someone in your life in which you trust.

    a. How has the trust been built?
    b. What about that person makes you trust them over someone else?
2. How would you define an acquaintance?
    a. Do you have many people in your life you consider to be acquaintances?
    b. To what extent would you give help or trust these acquaintances with something important? Why?
3. What types of organizations/community groups are you a part/member of?
    a. Why are you a part of those specific organizations?
    b. In what ways have these organizations personally benefitted you?
    c. Have there been times where these relationships were negatively affecting you? Explain these times and how they affected you.
4. Prior to the program, what was your expectation of the amount of bonding you would do with the other women?
    a. Positive, neutral, negative expectations?
5. Were there any women that you developed a closer relationship than with others? Tell me about that process.
    a. Was there anything about the community gardening program that jump started the closeness of your relationship? If so, please explain.
    b. Is this someone you feel you could rely on eventually in the future or even now if you needed a favor? Why do you feel this way?
    c. Would you be willing to help this person in the future if they needed help?
6. For women that you did not build as much of a bond with, tell me about those relationships and experiences
    a. Were there any people in the group that you did not like, yet still had to interact with them? Tell me about that experience.

BHK Model

1. How did the education topics contribute to your understanding of racism in the United States?
    a. Probe: Was there a topic that helped you understand how racism works in the United States?
2. Describe which topics made you aware of contributions and achievements of African Americans.
    a. Probe: Which topic do you feel celebrated African American achievements in history?
3. Which topics contributed to your understanding of social, political, and/or economic positioning of African Americans?
4. Describe with topics demonstrated how African Americans used cultural strengths to bring about action?
5. Do you believe that BHK encouraged you to commit to the gardening part of the program? If so, in what ways?
6. Explain how the education topics affected your mental health/well-being.
7. Did BHK help you to stay physically active outside of the program? How?
    a. Could BHK be used in future physical activity programs?
        i. Which type of physical activity programs would you want to see it be included?

Is there anything that we have not discussed today or anything else that you would like to share before we end the interview for the day?

APPENDIX E: IRB Approval Letter

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

Office of the Vice Chancellor for Research & Innovation

Office for the Protection of Research Subjects
805 W. Pennsylvania Ave., MC-095
Urbana, IL 61801-4822

Notice of Approval: New Submission

April 27, 2023

Principal Investigator	Susan Aguinaga
CC	Imani Canton
Protocol Title	*Tending to Our Roots to Increase Our Wellness (TRIOWell): A Community Gardening Intervention*
Protocol Number	24013
Funding Source	Unfunded
Review Category	Expedited 6, 7
Amendment Approved	April 27, 2023
Expiration Date	April 26, 2028

This letter authorizes the use of human subjects in the above protocol. The University of Illinois at Urbana-Champaign Office for the Protection of Research Subjects (OPRS) has reviewed your application and determined the criteria for exemption have been met.

The Principal Investigator of this study is responsible for:

- Conducting research in a manner consistent with the requirements of the University and federal regulations found at 45 CFR 46.
- Requesting approval from the IRB prior to implementing major modifications.
- Notifying OPRS of any problems involving human subjects, including unanticipated events, participant complaints, or protocol deviations.
- Notifying OPRS of the completion of the study.

Changes to an **exempt** protocol are only required if substantive modifications are requested and/or the changes requested may affect the exempt status.