

Baseline Characteristics and Physical Activity Patterns of Participants Enrolled in the Team Lifestyle Immersion Program (TLIP) Study

Jatheender kumar^{a*}, Flora Ukoli^b, Dontal Johnson^c, Emmanuel Adediran^d, Lisa Watson^e, Ephrem Bancha^f, Victory Obielodan^g, Unjanae Johnson^h, Adrian Samuelsⁱ, Chike Nzerue^j

^a Post-doctoral fellow, Department of Surgery Meharry Medical College Nashville, TN, USA; ^b Professor, Department of surgery and PI for Community Team Lifestyle Immersion Program for control of chronic disease prevention and control Meharry Medical College Nashville, TN USA.

* Corresponding author: ^ajkuma766@mmc.edu | ^bfukoli@mmc.edu, ^cdljohnson@mmc.edu, ^dEmmanuel.o.adediran@outlook.com, ^elwatson@mmc.edu, ^fEphrem.bancha@mmc.edu, ^gvictory.obielodan@mmc.edu, ^hUnjanae.johnson@mmc.edu, ⁱdsamuels@mmc.edu, ^jnzerue@mmc.edu

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Abstract

Hypertension remains a global cause of chronic illnesses, morbidity, and mortality. According to the CDC data (2024), about 120 million Americans have hypertension, and about a billion people globally, when defined by a systolic blood pressure greater than 140 mm Hg and at least a diastolic pressure of 80 mm Hg. Even more provocative are the suggestions that most people may develop hypertension if they live long enough. The unsatisfactory rates of hypertension control with only drug therapies emphasize the potential benefits of including lifestyle modifications for better control. Lifestyle intervention has been proposed to complement drug management of hypertension for decades. Regarding physical activity behavior, motivational messages could be tailored to focus on instrumental exercise goals for younger adults and meaningful relationships for older adults. This study aims to evaluate the baseline characteristics and physical activity patterns of participants enrolled in the team lifestyle immersion program (TLIP) study. To address these questions, this study leverages an existing TLIP P-50 project (5P50MD01347-04) at Meharry Medical College in Nashville, TN. The funding authority is NIH. Project number: 5P50MD01347-04. This study examines the baseline characteristics and physical activity patterns of participants enrolled in the team Lifestyle immersion program (TLIP) and followed at 6 and 12 months. To evaluate and analyze differences at baseline and in the prospective rate of change of physical activity patterns and progression of hypertension, and follow-up at 6 and 12 months.

This study highlights distinct sex- and age-specific patterns in exercise behaviors among individuals enrolled in a hypertension research protocol. Despite high physical access to fitness resources (66.7% overall living close to a gym), physical activity engagement varied markedly by demographic subgroup. Interventions aiming to improve cardiovascular risk profiles in hypertensive populations should focus on targeted strategies for middle-aged women, prioritizing habit formation to reduce total inactivity rather than exclusively emphasizing high exercise intensity.

Keywords: hypertension; systolic blood pressure; physical activity; lifestyle modification; community settings; Team Lifestyle Immersion Program

1. Introduction

Hypertension is the leading cause of cardiovascular diseases among African Americans in the United States; they record the highest incidence in comparison with other ethnic groups, and it appears to run in families with possible genetic components [1]. Blood pressure awareness, early detection, adequate treatment, management, and control continue to be an ongoing issue in African American communities. Studies of the complexity of blood pressure regulation indicate that hereditary factors

contribute up to 50% to the risk of hypertension in African Americans. Stressors associated with discriminatory experiences and sedentary lifestyles are also extrinsic influences on hypertension risk [1]. Hypertension is extensively associated with most chronic diseases, such as cardiovascular disease (CVD), chronic kidney disease (CKD), end-stage renal disease (ESRD), and mortality [2]. The American Heart Association expects that the direct and indirect costs of HTN in the US population would rise to 240 billion USD by 2030 [3]. Based on evidence, lifestyle factors like dietary habits, alcohol consumption, and physical inactivity are the main contributors to the high prevalence of this disease [4]. Regarding changes in physical activity behavior, motivational messages could be tailored to emphasize instrumental exercise goals for younger adults and meaningful relationships for older adults [5]. Strong and important motives for participation in physical activity differ by age and gender among adults. Motives that influence participation in physical activity are therefore critical for developing interventions to promote higher levels of involvement [6].

Hypertension remains a global cause of chronic illnesses, morbidity, and mortality. Recent data show that it may account for most disabilities and close to 9 million deaths globally [7]. About 120 million Americans have hypertension, and about a billion people globally when defined by a systolic blood pressure greater than 140 mm Hg, and at least diastolic pressure of 80 mm Hg [7]. Even more provocative are the suggestions that most people may develop hypertension if they live long enough [8]. Consequently, treatment of hypertension has substantial benefits, which have been shown by several trials to include reductions in the incidence of coronary artery disease (CAD), congestive heart failure, stroke, and chronic kidney disease, irrespective of age, gender, and race or ethnic background, and hypertension severity [8]. Although the benefits of blood pressure control are well recognized, studies confirm that lay awareness is very low, and adequate control of blood pressure continues to be an unmet goal as a result of treatment adherence issues among patients, resistant hypertension, therapeutic inertia on the part of the physicians, and their failure to use combination therapy. The unsatisfactory rates of hypertension control with only drug therapies emphasize the potential benefits of including lifestyle modifications for better control [9, 10]. Lifestyle intervention has been proposed to complement drug management of hypertension for decades. The possibility that some patients on a low-salt diet can remain normotensive after drug withdrawal was tested in a four-group randomized study, and the mild non-overweight patients with hypertension on the low-salt diet fared the best [11]. The Systolic Blood Pressure Intervention Trial (SPRINT) showed that targeting SBP <120 mmHg (intensive treatment) was more effective than targeting SBP <140 mmHg (standard treatment) for reducing cardiovascular risk among adults with hypertension [10]. The Hypertension Optimal Treatment (HOT) randomized trial also demonstrated the need for intensive blood pressure lowering to reduce the rate of cardiovascular events [11], whereas the ACCORD [12] and HOPE-3 [13] trials did not show significant benefit from intensive blood pressure control. The unsatisfactory rates of hypertension control with only drug therapies emphasize the potential benefits of including lifestyle modification for better control [9, 10]. Lifestyle intervention has been proposed to complement drug management of hypertension for decades. The Treatment of Mild Hypertension Study (TOMHS) randomized patients to five antihypertensive medications, with lifestyle modifications to reduce weight, sodium, and alcohol intake, and to increase physical activity. Their results supported a role for lifestyle modification as the initial treatment for stage 1 hypertension in their patients. [10].

Applying this strategy to communities burdened with hypertension warrants meeting people where they tend to congregate, such as churches, barbershops, beauty salons, and worksites. In such studies, physicians will act as consultants, define the functions, and train lay volunteers to conduct such studies [14]. Such programs generally include health promotion such as smoking cessation, weight reduction, and exercise [15]. The Sixth Report of the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VI) emphasized that clinicians stage their

patients with hypertension, assign them to one of three risk categories, select appropriate antihypertensive drug regimen, and address lifestyle modification [9]. The 1993 National High Blood Pressure Education Program Coordinating Committee underscored the complementary strategies for primary prevention of hypertension: the population-based approach and the individual approach targeting those at high risk for hypertension. The six approaches with proven efficacy for the prevention of hypertension were: moderate physical activity, normal body weight, limiting alcohol consumption, reducing sodium intake, adequate potassium intake, and a diet rich in fruits, vegetables, and low-fat dairy products, with reduced saturated and total fat [16]. These became the basis for several trials in the general population and as a component of public health and clinical practice. Several clinical trials provided evidence-based reports towards the end of the 20th century and the beginning of the 21st century supporting the important role of lifestyle components in promoting cardiovascular and overall health by lowering blood pressure. Regarding changes in physical activity behavior, motivational messages could be tailored to emphasize instrumental exercise goals for younger adults and meaningful relationships for older adults [5]. Exercising in a group can be more motivational, especially as individual sport athletes are known to be more likely to report anxiety and depression than team sport athletes [17]. Physical activity in a group setting can be likened to team sports, which are associated with greater enjoyment and intrinsic motivation, primarily due to social interaction, rather than to extrinsic factors such as health and fitness benefits [18]. Strong and important motives for participation in physical activity differ by age and gender among adults. Motives that influence participation in physical activity are critical for developing interventions to promote higher levels of physical activity [6]. When it comes to teaching group exercise classes, an intervention has to do more than motivate participants and ignite their passion for keeping fit, without creating competition [19].

Persistent disparities in the control of chronic diseases are linked to several barriers to health prevention, such as cultural norms, insufficient attention to health education, lack of access to physical activity, large portion sizes, and excess added sodium and sugar in foods produced by the food industry and restaurants [16]. In line with lifestyle modification proposed for several decades [9, 10, 20, 21], the goal of this study is to develop and evaluate the efficacy of a Lifestyle Immersion intervention for chronic disease control. Participants will be invited to engage in an active mental and practical process of involvement and commitment to lifestyle change that will benefit their health. The study will be conducted in two settings, community and health facility, thus addressing the individual, interpersonal, and organizational levels. This study introduces the team concept in health behavior modification, and will compare intervention effectiveness among participants in the study intervention (Team Arm) and the control group (Individual Arm). Participants will undergo a 6-month intervention adapted from the Centers for Disease Control and Prevention and the American Heart Association recommendations for blood pressure control and cardiovascular health that have been implemented in several clinical trials with impressive results. Participants will receive education to increase relevant knowledge and training to develop the necessary skills, in addition to strategies for successfully adhering to LS7 and the DASH [22]. The evidence for the effectiveness of lifestyle modification for blood pressure control and optimal health is compelling [23, 24, 25], especially in African American populations [10, 14].

This will be a randomized intervention developed using Community Engagement Research principles [26] and will be delivered in person, with selected education sessions on the Zoom platform and Online modules. Institutional Review Board (IRB) approval will be secured before implementation.

This study is therefore geared towards motivating and empowering participants to achieve as many goals as possible in their journey towards lifestyle modification for improved health. Using proven

interventions for hypertension prevention and control, the study is therefore geared towards motivating and empowering participants to achieve as many goals as possible in their journey towards lifestyle modification for improved health. Using proven interventions for the prevention and control of hypertension, we plan to initiate positive changes across all eight dimensions recommended by American Heart association(AHA).

2. Methods

2.1. Intervention

The TLIP study was designed to develop and evaluate the efficacy of a Lifestyle Immersion intervention for chronic disease control. Participants will be invited to engage in an active mental and practical process of involvement and commitment to lifestyle change that will benefit their health. Most interventions target individual health behavior performance and assess impact on their wellbeing. This study introduces the team concept in health behavior modification and will compare intervention effectiveness among participants in the study intervention (Team Arm) and the control group (Individual Arm). Participants will undergo a 6-month intervention adapted from the Centers for Disease Control and Prevention and the American Heart Association recommendations for blood pressure control and cardiovascular health, which have been implemented in several clinical trials with impressive results. Participants will receive education to increase relevant knowledge and training to develop the necessary skills, in addition to strategies for successfully adhering to LS7 and the DASH [27].

2.2. Partnership with Community Health Systems

Trained research staff will conduct research activities at the program partners' sites (MDHA and MWCHC) with assistance from an assigned staff member at each site. The study will be advertised in the MDHA newsletter; flyers will be placed in all mailboxes; a poster will be displayed in the common room; there will be active in-person recruitment by the site RA; and there will be recruitment by word of mouth. Patients diagnosed with hypertension in the last 3 years identified from the clinic records, and new patients with hypertension will be invited to participate by their physician. Flyers will be distributed in the clinics, and a poster will be displayed in the waiting area.

2.3. Eligibility Criteria

Participants must reside in Davidson and surrounding counties of Tennessee, must be at least 30 years old, be at increased risk for developing hypertension (already diagnosed or a strong family history), be able to consent, and not plan to move from this study area in 12 months after enrollment.

2.4. Recruitment

We shall recruit 110 adults from the community and 110 MWCHC/NGH hypertension patients to complete the study surveys, baseline body-fat distribution measurements, medical history, and lifestyle surveys. Enrolled participants will be randomized to a 'Team Arm' or 'Individual Arm' of the 6-month TLIP after signing consent. Teams will consist of 4 participants with diverse ages, genders, and health statuses.

2.5. Prescreening Interview

Research assistants (RAs) contacted patients, either in the clinic waiting room or by telephone, to conduct a prescreening interview. When recruiting by phone, RAs called patients from the clinic telephone so the number on the caller ID was familiar to the patients, and described the study as a Team lifestyle immersion program to control blood pressure and prevent chronic diseases[27]. The

objectives of the prescreening interview were 1) to describe the study to patients, 2) to assess interest in and availability to participate, and 3) to collect further information about health status to ensure eligibility. Eligible and interested participants were invited to participate in the study at Meharry Medical College. Participants completed a community team lifestyle immersion hypertension project survey booklet containing personal information and physical fitness and nutrition plans during the first visit of the study to obtain baseline data for the TLIP study (see Table 1)

Table 1. Physical fitness and Nutrition plan questionnaire

PHYSICAL FITNESS & NUTRITION PLAN	
List examples of mild - moderate intensity physical activity that you do.	
List examples of vigorous physical activity.	
How frequently do you exercise?	
1 ☐ Not at all	2 ☐ Once a week
3 ☐ Every other day	4 ☐ Everyday
5 ☐ Twice a day	6 ☐ 3 times a day
How long do you exercise each time?	
minutes.	

2.6. Measures

The study is being conducted in two settings, community and health facility, thus addressing the individual, interpersonal, and organizational levels. Most interventions target individual health behavior and assess their impact on well-being. This study introduces the team concept in health behavior modification and will compare intervention effectiveness among participants in the study intervention (Team Arm) and the control group (Individual Arm). Participants will undergo a 6-month intervention adapted from the Centers for Disease Control and Prevention and the American Heart Association recommendations for blood pressure control and cardiovascular health that have been implemented in several clinical trials with impressive results. Participants will receive education to increase relevant knowledge and training to develop the necessary skills, in addition to strategies for successfully adhering to LS7 and DASH [27].

2.7. Data Analysis Plan

The primary study outcomes are LS7 and DASH adherence scores at 6- and 12-months. Descriptive demographic statistics will be tabulated by study arm and study site. Continuous variables such as SBP, DBP, BMI, Waist, and Biomarker measures, will be assessed for normality and log10 transformed as needed. All analysis will be performed on an intention-to-treat basis, and statistical tests will be performed two-sided using a 5% significance level. Percent adherence (Low, Medium, High), for both LS7 and DASH, and patient healthy lifestyle knowledge between the study arms at 6- and 12-month, will be based on the difference from baseline to follow-up, using matched t-test and chi-square test were appropriate. All analyses will be performed in R/RStudio, SPSS, and SAS software (version 9.4; SAS Institute, Cary, NC).

3. Results

3.1. Participant Demographics

A total of 192 individuals (90 males, 102 females) participated in the study. The majority of participants were middle-aged (58.3% aged 40–64 years) or older adults (32.3% aged ≥ 65 years), with young adults (≤ 40 years) comprising 9.4% of the sample. Overall, 47.4% of participants had completed high school as their highest educational level, and 71.4% were not currently working. Gym accessibility was high across the total population, with 66.7% (n=128) reporting proximity to a fitness facility (see Table 2)

Table 2. Demographic Data of Participants Enrolled in a Hypertension Study (n=192)

Variables	Male (%)	Female (%)	Total %
Age (Years)			
≤ 40	7 (7.8)	11 (10.8)	18 (9.4)
40 – 64	58 (64.4)	54 (52.9)	112 (58.3)
≥ 65	25 (27.8)	37 (36.3)	62 (32.3)
Education			
< High School	17 (18.9)	21 (20.6)	38 (19.8)
High School	47 (52.2)	44 (43.1)	91 (47.4)
Some College	9 (10.0)	19 (18.6)	28 (14.6)
$\geq$ College	17 (18.9)	18 (17.6)	35 (18.2)
Work Status			
Not Working	68 (75.6)	69 (67.6)	137 (71.4)
Part-Time	7 (7.8)	5 (4.9)	12 (6.3)
Full-Time	15 (16.7)	28 (27.5)	43 (22.4)
Close to Gym	61 (67.8)	67 (65.7)	128 (66.7)

Significance: $p < 0.05$ *, $p < 0.01$ **, $p < 0.001$ ***

3.2. Sex Differences in Exercise Habits

Males were significantly more likely to meet recommended physical activity guidelines compared to females (51.1% vs. 33.3%, $p < 0.05$). Exercise frequency also differed significantly between sexes ($\chi^2 = 6.65$, $p = 0.036$). Females exhibited a higher rate of complete physical inactivity (37.3% vs. 21.1%), whereas males were more likely to report exercising ≥ 7 times per week (54.4% vs. 39.2%). Mild physical activity participation was near-universal across both sexes (94.4% males, 91.2%

females), and engagement in moderate-to-vigorous physical activity did not differ significantly between males (34.4%) and females (38.2%, $p=0.588$) (see table 3)

Table 3. Exercise Habits by Sex

Variables	Male (%)	Female (%)	Total
Meet recommendation *	46 (51.1)	34 (33.3)	80
Mild	85 (94.4)	93 (91.2)	178
Moderate-Vigorous	31 (34.4)	39 (38.2)	70
Frequency *			
No exercise	19 (21.1)	38 (37.3)	57
1–4x/week	22 (24.4)	24 (23.5)	46
≥7x/week	49 (54.4)	40 (39.2)	89

Significance: $p<0.05$ *, $p<0.01$ **, $p<0.001$ ***

3.3. Age-Stratified Exercise Patterns

- **Males:** Exercise habits exhibited a trend toward variation across age cohorts. Recommendation compliance was highest among younger males (71.4%) and older males (60.0%), compared to middle-aged males (44.8%). Older males (≥65 years) demonstrated the lowest rate of complete inactivity (8.0%) and the highest frequency of daily exercise (72.0% exercising ≥7 times per week).
- **Females:** Middle-aged females (40–64 years) presented the highest risk profile for inactivity, with 46.3% reporting no exercise and only 27.8% meeting exercise recommendations. Conversely, older females (≥65 years) showed lower rates of inactivity (24.3%) and higher compliance with physical activity recommendations (37.8%). (see table 4 and 5).

Table 4. Male Exercise Habits by Age (Years)

Variables	≤40 (%)	40 – 64 (%)	≥65 (%)
Meet recommendation *	5 (71.4)	26 (44.8)	15 (60.0)
Mild	6 (85.7)	54 (93.1)	25 (100.0)
Moderate-Vigorous	2 (28.6)	22 (37.9)	7 (28.0)
Frequency *			
No exercise	2 (28.6)	15 (25.9)	2 (8.0)
1–4x/week	2 (28.6)	15 (25.9)	5 (20.0)
≥7x/week	3 (42.9)	28 (48.3)	18 (72.0)

Significance: $p<0.05$ *, $p<0.01$ **, $p<0.001$ ***

Table 5. Female Exercise Habits by Age (Years)

Variables	≤40 (%)	40 – 64 (%)	≥65 (%)	Total	%
Meet recommendation *	5 (45.5)	15 (27.8)	14 (37.8)	34	(33.3)
Mild	8 (72.7)	52 (96.3)	33 (89.2)	93	(91.2)
Moderate-Vigorous	6 (54.5)	16 (29.6)	17 (45.9)	39	(38.2)
Frequency *					
No exercise	4 (36.4)	25 (46.3)	9 (24.3)	38	(37.3)
1–4x/week	3 (27.3)	9 (16.7)	12 (32.4)	24	(23.5)
≥7x/week	4 (36.4)	20 (37.0)	16 (43.2)	40	(39.2)

Significance: $p < 0.05$ *, $p < 0.01$ **, $p < 0.001$ ***

4. Discussion

This study highlights distinct sex- and age-specific patterns in exercise behaviors among individuals enrolled in a hypertension research protocol. Despite high physical access to fitness resources (66.7% overall living close to a gym), physical activity engagement varied markedly by demographic subgroup.

The significant disparity in meeting physical activity recommendations between males (51.1%) and females (33.3%) ($p < 0.05$) is primarily driven by overall frequency rather than intensity. Both sexes reported similar participation rates in moderate-to-vigorous exercise (~34%–38%), but females were significantly more likely to engage in no regular exercise (37.3% vs. 21.1%).

Age-stratified analyses further identify middle-aged females (40–64 years) as the cohort at greatest risk for inactivity (46.3% non-exercisers). This middle-aged dip in exercise adherence may reflect competing occupational, caregiving, or domestic responsibilities. Interestingly, older adults (≥ 65 years)—particularly older males—demonstrated strong adherence to frequent activity regimens.

Clinical Implication: Interventions aimed at improving cardiovascular risk profiles in hypertensive populations should focus on targeted strategies for middle-aged women, prioritizing habit formation to reduce overall inactivity rather than exclusively emphasizing high exercise intensity.

- Males lead across both positive metrics: they show higher overall exercise compliance (<40 years at 71.4%) and dominate the high-frequency exerciser group (<65 years at 72.0%).
- Females show lower peak compliance (>40 years at 45.5%) and represent a smaller share of the high-frequency group (<65 years at 43.2%).
- Inactivity risk peaks between ages 40–64 for both groups, with females showing a slightly higher rate of no exercise (46.3%) compared to males (26%–29% for ages >40 and 40–64) (see Table 6).

Table 6. Data Summary

Demographic Group	Highest Recommendation Compliance	Primary Exercise Inactivity Risk	High-Frequency (≥ 7 x/week) Leader
Males	<40 years (71.4%)	>40 & 40–64 years (~26%–29% no exercise)	<65 years (72.0%)
Females	>40 years (45.5%)	40–64 years (46.3% no exercise)	<65 years (43.2%)

5. Limitations

The generalizability of these results is subject to certain limitations. Some of the screening events were held at MDHA (Metropolitan Development Housing Authority) housing projects in Nashville, TN, where residents have disabilities that restrict mobility and access to exercise facilities, as well as transportation issues. Although the data obtained were self-reported, the questionnaire items completed at the time of screening were confirmed directly with the person, which may introduce self-reporting bias. Also, participants in these housing projects may not feel motivated or connected or value the importance of healthy habits. More information about the screening could be confirmed by

the participant's primary care physician or public health nurse, which was not considered in the study.

Declarations

Competing interests

The authors declare no conflict of interest.

Ethics approval and funding

The project was approved by the Institutional Review Board (IRB) of Meharry Medical College (Reference # 25-02-1555). The funding authority is NIH. Project number: 5P50MD01347-04.

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