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Research Article

Validation of Three-Minute Walk Test for the Assessment of Functional Capacity among Patients with Hypertension

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ABSTRACT

Objective: Time to complete six-minute walk test (6-MWT) could be cumbersome in a busy clinical setting. However, it is not known whether a shorter duration of three-minute walk test (3-MWT) is capable of assessing valid functional capacity (FC). This study investigated the validity and responsiveness of 3-MWT among patients with hypertension.

Methods: This correlational study involved 150 patients with mild to moderate hypertension recruited from a Nigerian university teaching hospital using purposive sampling technique. Anthropometric indices, socio-demographic characteristics and cardiovascular parameters were recorded. FC was assessed using the two walk tests. Participants underwent four trials of the 3-MWT as well as 6-MWT in a random order on a 30 m level ground corridor. The walk tests were performed on four different occasions over a period of four weeks at one-week interval. FC (maximum oxygen consumption: VO_2 max) was estimated. Data were analyzed using descriptive and inferential statistics. Alpha level was at $p<0.05$.

Results: The means of distance walked for 3-MWT and 6-MWT were 194.76 ± 36.50 m and 377.87 ± 66.73 m respectively. There were significant correlations between distance walked during 3-MWT and derived VO_2 max from 6-MWT ($r=0.937$; $p=0.001$). The 3-MWT and 6-MWT on Cronbach's α and Intra-class correlation coefficient (3-MWT: ICC=0.998) and (6-MWT: ICC=0.997) respectively at 95% confidence interval (CI: -2.14 – -1.14). The effect size for the responsiveness of 3-MWT and 6-MWT were 0.16 and 0.27 respectively. Age, weight and height were important predictors of FC.

Conclusion: The 3-MWT is valid and responsive for assessing functional capacity among patients with hypertension.

Keywords: Validity; Responsiveness; Functional capacity; 3 Minute walk test; Hypertension

INTRODUCTION

Cardiovascular disease (CVD) is one of the important public health challenges worldwide of which low and middle income countries bear the highest brunt ofmorbidity and mortality [1]. The leading risk factor for CVD is hypertension and is associated withstroke, hypertensive heart disease, chronic heart and kidney failures etc. [2]. Uncontrolled hypertension is often associated with serious end-organ damage thus, putting an unimaginable burden on the stressed health systems [3]. Hence, comprehensive treatment of hypertension has become a collective responsibility in order to reduce its continuous threat to health systems.

There is substantial evidence that adequate level of blood pressure control using pharmacological approach helps to delay or regress target organ damage [4]. However, owing to adverse effects of medications, its cost, poor adherence and general

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labeling of taking antihypertensive medications, successful treatment of hypertension has been reported to be below optimal level [5]. Hence, non-pharmacological approaches including weight control programme, dietary plan, exercise and regular physical activityhave been advocated by many health authorities [6,7]. Exercise as a non-pharmacological approach plays an important role in maintaining cardiorespiratory fitness, appropriate body composition and helps to control hypertension, howevermany people with hypertension are skeptical about engaging in regular exercise practice believing that it might worsen their condition. Thus, for effective exercise prescription, training and safety, a baseline assessment of functional capacity (FC) is considered to be an important step prior to exercise intervention [8].

Numerous investigations have demonstrated that the assessment of FC provides important diagnostic and prognostic information in a wide variety of clinical and research settings [9]. Furthermore, several techniques have been designed for the assessment of FC in patients with hypertension which include cardiopulmonary exercise testing using bicycle ergometer or treadmill and gas analyzer methods [10]. However, laboratory assessment of FC is time consuming, expensive, inaccessible and oftentimes not practicable in clinical settings in many health facilities [11]. Hence, assessment techniques such as simple walk tests that are easy to administer, inexpensive, well tolerated and not time consuming for both the patients and health care provider most especially in developing countries are considered to an added advantage [12].

Several walk tests have been developed to assess FC in patients with hypertension. Popular among the walk tests are twelve-minute walk test (12-MWT), shuttle walk test (SWT) and six-minute walk test (6-MWT). However, the 6-MWT is commonly used in the assessment of FC in patients with cardiopulmonary challenges and other chronic diseases [13,14]. The 6-MWT is a practical simple test that includes at least a 30-meter hallway but requires no exercise equipment or advanced training for technicians. The self-paced 6-MWT assesses the submaximal level of FC but sometimes allows resting interval during the assessment. Nonetheless, many patients do not achieve maximal exercise capacity during the 6-MWT; instead, they choose their own intensity of exercise and are allowed to stop and rest during the test.Hence, a shorter duration that could be taken at a goal may be a good alternative for easy assessment of FC.

The three-minute walk test (3-MWT) is also a submaximal walk test that is simple, non-incremental and easy to carry out both in the clinical setting as well as for research purposes. However, it is not known whether the 3-MWT is capable of invoking enough changes in the cardiovascular system the same way as 6-MWT in the assessment of FC. Furthermore, there is dearth of information on the psychometric properties of 3-MWTin the assessment of FC among patients with hypertension. Hence, the purpose of this study was to determine the validityand responsiveness of the 3-MWT in the assessment of FC among patients with mild to moderate hypertension.

METHODOLOGY

Participants

Participants for this study were patients with mild to moderate hypertension (≥ 140/90 ≤ 179/109 mmHg) receiving treatment at the Cardiac Care Unit, ObafemiAwolowo University Teaching Hospitals Complex, (OAUTHC) Ile-Ife, Osun State, Nigeria. The design for this study was a correlational study and purposive sampling technique was used to select the participants. Eligibility for inclusion in this study were mild to moderate hypertension (≥ 140/90 ≤ 179/109 mmHg), whose ages ranged between between 40 and 70 years and were regularly taking their antihypertensive medications.Participants that were excluded from this study if presented with unstable angina and peripheral arterial disease, pulmonary and neurological diseases, knee arthritis and any form of musculoskeletal dysfunction that limit self-pacedwalking.

The sample size for this study was based ona sample size formula adopted from the computer program for epidemiologists (PEPI), version 3.01. The formula is applicable for estimating sample size for single proportion as described by Abramson and Gahlinger, [15]. The following parameters were considered to arrive at a minimum sample size for this study; a prevalence rate of 36.6% of hypertension was reported among elderly individuals in Ile–Ife using the 140/90 mmHg cut-off point [16]. Furthermore, a precision margin of 5% with a standard normal deviate of 1.96 at 95% confidence interval was chosen. Thereafter, N is considered the required sample size with a maximal allowable difference from the true proportion of 5% (0.05) was considered. Z-value (Z-value for 95% confidence level equals 1.96), and pisthe estimated proportion of an attribute that is present in the population valued at 11.2%whileeisthe desired level of precision (i.e confidence interval expressed as decimal=0.05). Hence, considering the sample size formula, N=Z2{p (1-p)}/e2, a minimum sample size of 150 participants was needed for the study.

PROCEDURE

Ethical approval for this study was sought and obtained fromthe Ethics and Research Committee with protocol number (ERC/ 2017/06/26), OAUTHC, Ile-Ife, OsunState, Nigeria. The purpose of the study was explained to the participants and an informed consent was obtained from the participants before the commencement of the study. Socio-demographic characteristics including age, sex, occupation, level of education were recorded. Anthropometric characteristicsincluding body weight, height, hip and waist circumference were measured and recorded. Body Mass Index (BMI) and Waist to Hip Ratio (WHR) were also calculated.Duration of onset of hypertension, antihypertensive medications and dosage prescribed by the attending cardiologist were recorded. After 10 minute of quiet sitting, participants' baseline cardiovascular parameters including systolic, diastolic blood pressures and heart rate were measured using standard procedures while rate pressure product was calculated from the product of heart rate and systolic blood pressure.

Assessment of functional capacity

Six-minute walk test (6-MWT): The 6-MWT was conducted in line with the guidelines of the America Thoracic Society [17]. Participant was allowed to rest for a period of 10 minutes in sitting position before the commencement of the walk test. A 30-meter level corridor within the Cardiac Care Unit of OAUTHC, Ile-Ife was used for the walk test. Participants were instructed to walk from the starting point to the end at their own selected pace while attempting to cover as much ground as possible in six minutes. Encouragement was provided every 30 seconds or more in a standardized manner by saying: "you are doing well" or "keep up the good work". Participant was reminded of the time remaining for the completion. The total distance covered during the six minute was recorded to the nearest whole number in meters. At the end of 6-MWT test, participant was asked to rate his or her exertion level using the 10 point modified Borg scale. Cardiovascular parameters including heart rate, systolic and diastolic blood pressures were measured immediately after walk tests. Functional capacity (maximum oxygen consumption- O_2max) was estimated using the America College of Sport Medicine predictive equation [18].

Computation: VO_2 max (ml/O_2Kg/min)=speed (m/min) × 0.1 m/O_2/Kg+3.5 m/O_2/Kg/min

Three-minute walk test (3-MWT): The 3-MWT was conducted using the same procedure used for the 6-MWT. Participants were instructed to walk from the starting point to the end at their own selected pace while attempting to cover as much ground as possible in three minutes on a 30-meter level corridor using the same instructions during 6-MWT. Total distance covered during three minutes was recorded to the nearest whole number in meters. At the end of 3-MWT test, participant was asked to rate his or her exertion level using the 10 point modified Borg scale.Similarly, cardiovascular parameters including heart rate, systolic and diastolic blood pressures were measured immediately after the walk test. Functional capacity (maximum oxygen consumption) was estimated from total distance covered. The walk test was allocated to the participants randomly using simple ballot system. The 3-MWT and 6-MWT were administered separately on the same day once every week for four weeks. Participants who performed the 3-MWT first wereallowed to rest for 30 minutes before another round of 6-MWT and vice versa.

Data analysis

egression analysis was used to compute a predictive equation for the estimation of FC using 3-MWT. he reliability of the 3-MWT was determined by the Intra Class Correlation coefficient (ICC) method using Cronbach's α at 95% Confidence Interval (CI). Pearson Product Moment Correlation Coefficient was used to determine the validity of the 3-MWT. Effect size (mean change/SD of base line scores) while standardized response mean (SRM) (mean change/SD of change scores) were calculated to evaluate responsiveness (characterizing the ability of a measure to change over a specified time frame) of walk tests. Values of<0.20, 0.50 and > 0.80, respectively, have been proposed to represent low, moderate and high responsiveness [19]. Alpha level was set at $p<0.05$. Statistical package of Social Sciences (SSPS) version 21 was used to perform analysis.

Table 1: Socio-demographic characteristics, antihypertensive medications prescribed and onset of hypertension.

Variable	Frequency	%
Sex		
Male	46	30.7
Female	104	69.3
Age (years)		
40 – 50	40	31.5
51 – 60	47	31.3
61 – 70	63	42.0
Occupation		
Artisan/farmer	43	26.7
Business	21	14.0
Civil servant	32	21.3
Retiree	54	38.0
Income (monthly)		
< ₦ 100,000	77	51.3
₦ 100,000– ₦ 200,00	45	30.0
> ₦ 200,000	28	18.7
Antihypertensive medication prescribed		
ACE-I	82	54.7
ARB	15	10.0
ASA	16	10.7
CCB	64	42.7
DIU	47	31.3
BB	20	13.3
Onset of hypertension		
≤ 5 years	88	58.7
>5 years	62	41.3

Key: ACE-I: Angiotensin Converting Enzyme Inhibitor; ARB: Angiotensin Receptor Blocker; ASA: Aspirin; CCB: Calcium Channel Blocker; DIU: Diuretics; BB: Beta Blocker.

The percentage of medications prescribed sum up more than 100% due to the combination of antihypertensive medication.

RESULTS

Table 1 shows socio-demographic characteristics, onset of hypertension, and antihypertensive medications prescribed for the participants. The results show that a majority, 104(69.3%) were females and more than a third, 63(42.0%) were older than 60 years with a mean age of 57.45 ± 9.1 years of participants. More than half, 88(58.7%) of participants were within 5 years of onset of hypertension. Furthermore, prescribed antihypertensive medications show that more than half, 82 (54.7%) were placed on angiotensin converting enzyme inhibitor (ACE-I) and less than a third, 47(31.3%) were using diuretics.

Table 2: Anthropometric characteristics, cardiovascular parameters, three and six minute walk distance covered, estimated maximum oxygen consumption and speed for all participants.

Variable	Mean ± S.D
Anthropometric characteristics	
Height (m)	1.63 ± 0.1
Weight (kg)	71.10 ± 12.6
BMI (kg/m2)	26.76 ± 4.4
WHR	0.90 ± 0.1
Cardiovascular parameter	
SBP (mmHg)	139.78 ± 18.5
DBP (mmHg)	84.43 ± 11.7
HR (bpm)	77.94 ± 13.1
RPP X (103)	10.91 ± 2.4
Walk Distance	
3-MWD (m)	194.76 ± 36.5
6-MWD (m)	377.87 ± 66.7
Estimated Functional capacity (VO2Max)	
3-MWD (ml/O2kg/min)	9.99 ± 1.2
6-MWD (ml/O2kg/min)	9.80 ± 1.1
Speed	
3-MWD (m/min)	64.92 ± 12.2
6-MWD (m/min)	56.31 ± 11.1

Key: SD: Standard Deviation; BMI: Body Mass Index; WHR: Waist Tt Hip Ratio; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; HR: Heart Rate; RPP: Rate Pressure Product;3-MWD: 3-Minute Walk Distance; 6-MWD: 6-Minute Walk Distance; VO2Max: Maximum Oxygen Consumption.

Table 3: Comparison of cardiovascular parameters response to 3-MWT and 6-MWT in the firstand fourth week.

Variable	1st week Mean ± S.D	4th weekMean ± S.D	t-cal	p-value
3-MWT				
SBP (mmHg)	139.78 ± 18.5	135.85 ± 16.9	4.343	0.001*
DBP (mmHg)	84.43 ± 11.7	81.85 ± 9.3	3.009	0.003*
HR (bpm)	77.94 ± 13.1	79.35 ± 9.8	-1.875	0.043*
SBP (mmHg)	139.78 ± 18.5	134.50 ± 15.6	4.32	0.001*
DBP (mmHg)	84.43 ± 11.7	81.66 ± 8.9	3.238	0.002*
HR (bpm)	77.94 ± 13.1	79.39 ± 10.1	-2.099	0.038*

*Significant at p<0.05

Key: 3MWT: 3-Minute Walk Test; 6MWT: 6-Minute Walk Test; SBP: Systolic Blood Pressure; DBP: Diastolic Blood Pressure; HR: Heart Rate.

Table 2 shows anthropometric characteristics, cardiovascular parameters; total distance walked during the 3 and 6-MWTs and estimated maximum oxygen consumption (VO_2 max) of all participants. The means of body mass index, systolic blood pressure and 3-minute walk distance (3-MWD) were 26.8 ± 4.4 Kg/m_2, 139.8 ± 18.5 mmHg and 194.8 ± 36.5 m respectively. The functional capacity (FC) presented as estimated (VO_2 max) for 3-MWD is 9.9 ± 1.2 mL/O_2 kg/min. Comparison of cardiovascular parameters response to 3-MWT and 6-MWT in the first and fourth week are presented in Table 3.

Table 4: Correlations between 3-Minute walk distance and derivatives of 6-Minute walk distance over a period of four weeks.

Variable	3-MWD Mean ± S.D	r	p-value
6-MWT: 1st week			
6-MWD (m)	377.87 ± 66.7	0.937	0.001*
VO2 Max (ml/O2kg/min)	9.80 ± 1.1	0.937	0.001*
Speed (m/min)	56.31 ± 11.1	0.937	0.001*
6-MWT: 2nd week			
6-MWD (m)	383.70 ± 68.2	0.932	0.001*
VO2 Max (ml/O2kg/min)	9.89 ± 1.1	0.932	0.001*
Speed (m/min)	63.95 ± 11.4	0.932	0.001*
6-MWT: 3rd week			
6-MWD (m)	383.70 ± 68.2	0.931	0.001*
VO2 Max (ml/O2kg/min)	9.90 ± 1.1	0.931	0.001*
Speed (m/min)	63.95 ± 11.4	0.931	0.001*
6-MWT: 4th week			
6-MWD (m)	395.94 ± 67.9	0.917	0.001*
VO2Max (ml/O2kg/min)	10.10 ± 1.13	0.917	0.001*
Speed (m/min)	65.99 ± 11.3	0.917	0.001*

*Significant at p<0.05distance

Key: S.D: Standard Deviation; 3MWT: 3-Minute Walk Test; 6-MWT: 6-Minute Walk Test; 6-MWD: 6-Minute Walk Distance; VO2Max: Maximum Oxygen Consumption.

The results show that there were significant differences in the first and fourth of the tests. During the 3-MWT, significant differences were found in the systolic blood pressure (SBP) in first and fourth week with 139.78 ± 18.47 and 135.85 ± 16.91 mmHg (t=4.343; p=0.001), respectively. Similarly, significant differences were found in heart rate (HR) following the 6-MWT in the first and fourth week of the test; HR: 77.94 ± 13.05 and 79.39 ± 10.12 (t=-2.099; p=0.038), respectively. The result of correlation between 3-MWD and the derivatives of 6-minute walk distance (6-MWD) showed significant correlations each week over a period of four weeks. During the first week, there were significant correlations between 3-MWD and each of 6-MWD (r=0.937; p=0.001) and VO_2 max (r=0.937; r=0.001). Similarly, during the fourth week, there were significant correlations between 3-MWD and each of 6-MWD (r=0.917; p=0.001) and VO_2 max (r=0.917; p=0.001) (Table 4).

Table 5: Test-retest reliability test for 3-minute and 6-minute walk test at one week interval.

			95% CI	
Variable	Cronbach's α	ICC	Lower – Upper	p value
3-MWT				
1st week Vs. 2nd week	0.998	0.997	-2.14 – -1.14	0.001*
6-MWT				
1st week Vs. 2nd week	0.998	0.995	-6.49 – -4.18	0.001*

*Significant at p<0.05

Key: CI: Confidence Interval; 3-MWT: 3-Minute Walk Test; 6-MWT: 6-Minute Walk Test; ICC: Intra-Class Correlation Coefficient.

The result of test-retest reliability for 3-MWT and 6-MWT at one week interval is presented in Table 5. At one week interval, test-retest reliability for 3-MWT showed that the Cronbach's α and intra-class correlation coefficient (ICC) at 95% confidence interval were 0.998 and 0.997(CI=-2.14 – -1.14) (p=0.001), respectively.

Table 6: Measures of responsiveness for 3-minute and 6-minute walk tests between the first and fourth week.

	1st week	4th week				
Variable	3-MWD Mean ± SD	6-MWD Mean ± SD	Mean Difference Mean ± SD	t-value	Effect Size	SRM
Walk Test						
3-MWT	194.76 ± 36.50	200.75 ± 34.48	05.99 ± 02.02	0.937	0.16	2.97
6-MWT	377.87 ± 66.73	395.93 ± 67.90	18.06 ± 01.17	0.917	0.27	15.43

Key: 3-MWD: 3-Minutewalk Distance; 6-MWD: 6-Minute Walk Distance; 3-MWT: 3-Minute Walk Test, 6-MWT: 6-Minute Walk Test, SRM: Standard Response Mean.

The results of measures of responsiveness for 3-MWT and 6-MWT between the first and fourth week showed that there were significant improvements in both the 3-MWT and 6-MWT after fourth week. For the 3-MWT, the 3-MWD in the first week increased from 194.76 ± 36.50 to 200.75 ± 34.48 m at fourth week. A mean difference of 05.99 ± 02.02 with an effect size (ES) of 0.16 and a standard response mean (SRM) of 02.97. The ES of 6-MWT was higher than that of 3-MWT with estimated responsiveness of SRM for both 3-MWT and 6-MWT as 2.97 and 15.43 respectively. For the predictive equation for the assessment of FC among patients with hypertension, a linear regression equation was used to establish predictive equation for the 3-MWT. The equation showed that age, weight and height were important predictors of FC in hypertension (Table 6).

Computation: 3-MWT (VO_2 max)=8-0.036 × age(years)-0.014 × weight (Kg)+3.083 × height (m)

DISCUSSION

This study investigated the validity, reliability and responsiveness of the 3-minute walk test (3-MWT) in the assessment of functional capacity (FC) among patients with hypertension. Findings from this study showed that the mean age of patients with hypertension is 57.45 ± 9.09 years. This is similar to the findings of previous studies that hypertension is more common among individuals approaching mid-life [16,20]. The plausible explanation for this may be as a result of changes in the physiological pattern of individuals in this age category. It is also possible that progressive increase in the arterial stiffness of large conduit arteries may be responsible for increase in the prevalence of hypertension in this age category.

Findings from this study show that the mean distance covered during 6-MWT was 377.87 ± 66.73 m [21,22]. This is lower compared to reported values among apparently healthy subjects in some previous studies. Tsang reported a range of 606 m and 645 m for similar age group while Gibbons, et al.reported a range between 699 m and 800 m for apparently healthy individuals [22]. Similarly, the distance covered during the 3 MWT is 194.76 ± 36.50 m. The difference between this study and the previous studies might be as a result of underlying cardiac condition and the procedures used in performing the test. In agreement with our findings, Morales, et al. [23] and Lucas, et al. [24] reported a 6-MWD of 448 m and 393 m respectively among patients with cardiac challenges.Although comparison of reference values across populations is believed to be difficult because of individual and racial differences, self-motivation and mood,and demographic variations, the mean 6-MWD value obtained in this study is still within the range reported for patients with cardiac conditions.

The 6-MWT is highly related to walking patterns in adults and is similar to daily activity which could be used to assess patient's ability to perform activity of daily living [25]. Although there are many timed walk tests that have been developed for the evaluation of FC in healthy subjects [26,27], the 6MWT appears to be easy to administer, more objective and correlates significantly with FC in patients with cardiopulmonary challenges [28]. Findings from this study showed that the 3-MWT demonstrated good and acceptable evidence of validity. The concurrent validity reported in the present study is high (r=0.97) compared to findings from previous studies. The 3-MWT has good convergent validity with 6-MWT, speed, and VO2 max using Pearson correlation coefficients. This supports the validity of the 3-MWT as a measure of FC in patients with hypertension. Leung, et al.also reported a significant correlation between 6-MWT and a shorter walk duration of 2-MWT in patients with Chronic Obstructive Pulmonary Disease (COPD) [29]. Also, Bohannon, et al. reported significant correlation between 6-MWT and other walk tests of shorter duration [30]. The plausible explanation for the correlation may be due to walking pattern and gait speed during the 3-MWT and 6-MWT which is similar and have the same effect on FCof individuals with hypertension irrespective of distance covered.

Leung, et al. reported that the validity of 2-MWT validity test among patients with COPD was comparable to that of 6-MWT. In comparison with the findingsof this study, the 3-MWT demonstrated good validity test compared to the 6-MWT. The plausible explanation for high validity in this study could be that walking is a daily activity and many individuals with hypertension may be involved in regular sub-maximal walk. Construct validity of a measure can be examined using the item-scale correlations in which convergent validity indicates correlation between an item and its own scale, while discriminant validity indicates correlation between an item and any of the other scales [31]. High and positive significant correlation between the 3-MWT and its constructs (walk speed, maximum oxygen consumption (VO_2 max) indicates good convergent validity.

Findings from this study showed that the 3-MWT has good evidence of test-retest reliability in a sample of patients with hypertension. The distances covered during the 3-MWT and 6-MWT were 194.76 ± 36.50 m and 377.87 ± 66.73 m respectively. Although there were progressive increases in the distance covered each week of walk test for 3-MWT and 6-MWT, correlation between the two tests was high and almost perfect. This is in agreement with Iriberri,et al. who reported progressive increase in the distance covered during 6-MWT conducted on nine different occasions [32]. Furthermore, Salbach,et al. were of the opinion that the significant improvement in the walked distance was probably due to learning effects as subjects remembered their performance during walk test [33]. It is also possible that word of encouragement given through external cues such as 'try harder' on subsequence tests may contribute to progressive increase in the distance walked. It is known that motor learning occurs as a result of practice and experience with a task, resulting in a relatively permanent increase in proficiency at the task [34].

The distance walked during the four different trials of 3-MWT demonstrated that the result is reproducible. This finding is in agreement with that of Alison, et al.who reported the repeatability of timed walk test performed at home among survivors of critical illness [35]. Reliability of the distance walked by the participants are fundamental measurement property that is relatively easy to determine, and is quantified in terms of the degree of consistency and repeatability when properly administered under similar circumstances for a specific population [36].

The result of this study showed significant reduction in the systolic and diastolic blood pressure after four weeks of walking programme. Even though, this cannot be solely attributed to these walk tests because participants are taking anti-hypertensive drugs. Finding from this study is in agreement with previous studies who reported that exercise has the capability to improve cardiovascular health by increasing cardiorespiratory fitness and lowers blood pressure [14,37]. Also, the result of this study showed improvement in 3-MWT after four weeks of walking programe, this indicates good responsiveness. Although there was no specific exercise intervention to improve functional capacity, many patients who participated in this study were on their regular anti-hypertensive medications and engage in regular walking. It is possible that this may be responsible for the responsiveness of the 3-MWT in this study. Furthermore, this finding supports that of Eiser, et al. who reported that short duration walk test is sensitive to change if it is done more than once by the patients receiving treatment for cardiovascular disease [38]. Previously, several factors have been identified to contribute to less responsiveness of many walk tests [30,39]. For instance, longer duration walk test could be exhausting for some patients and it could be more time consuming in a busy health care setting. In fact,some patients with other co-morbidities could find it difficult to complete 6-MWT at a go, thus making the data difficult to be interpreted. In this study, the 3-MWT was less tiring and was found to be as effective as the 6-MWT among patients with hypertension. Similarly, finding from this study is in agreement with that of Leung who concluded that shorter walk tests demonstrate responsiveness to change after a period of treatment programme [29,39].

Finding from this study showed that age, height and weight were important predictors of maximum oxygen consumption in the assessment of FC in patients with hypertension. This finding is similar to that of previous studies who reported that age, height and weight were important predictors of maximum oxygen consumption among patients with cardiovascular disease [16,40]. This may be due to the fact that age, height and body weight are associated with manner of walking and could influence cardiovascular system during walk test. Also, age could contribute to prediction of maximum oxygen consumption due to physiological changes in the arterial wall of the major arteries in the elderly individuals with hypertension. It is noteworthy to mention that there is dearth of literature to use to discuss findings of this study. Hence, this study could only relate findings with that of 6-MWT that has been recognized as gold standard in the assessment of FC.

Findings from this study should be interpreted with caution due to inherent limitations therein. The research design is correlational and may limit the generalizability of this study to the population of patients with hypertension. Although the participants were recruited from Cardiac Care Unit in the teaching hospital with evidence of controlled blood pressure, this finding may be different from sample of patients with uncontrolled hypertension. Furthermore, patients in this study were placed on different anti-hypertensive medications and it has been reported that some anti-hypertensive medications might mask FC, thus affecting the outcome of this study. Furthermore, it is important to note that walk test is a self-pacing protocol and several factors including but not limited to mood and motivation of the participants, methods of conducting the test and individual differences have been reported to influence its outcome during the assessment of FC in apparently healthy individuals and patients with chronic diseases including hypertension. Based on the findings in this study, the 3-MWT has demonstrated its capability in the assessment of FC in patients with hypertension.

CONCLUSION

The 3-MWT is valid, reliable and responsive in the assessment of functional capacity among patients with mild to moderate hypertension. It is simple, quickandwell tolerated among the patients with hypertension.

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CONFLICT OF INTEREST

The authors declared none.

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