

ORIGINAL RESEARCH

# Effects of an aerobic dance programme on percent body fat in stage one hypertensive adults aged 30-59

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## Abstract

Hypertension stands out as a significant concern affecting roughly 1.5 billion individuals globally and is responsible for around 10.8 million premature deaths annually. High percent body fat in humans can contribute to the development of hypertension. The prevalence of hypertension in Uganda is high and it is a major mortality hazard factor for Ugandans. This study aimed to investigate the effects of a 12-week aerobic dance programme on percent body fat in stage one hypertensive adults aged 30-59 in Uganda. This study employed pre-post-test experimental research design. The study participants were randomly assigned to either the experimental group, where a 12-week moderate intensity aerobic dance programme was administered thrice a week for 45 minutes per session, or control group, where no intervention was administered and participants maintained their regular routines. The measurements of percent body fat were done using a Tanita body composition monitor at baseline and post the programme. A paired sample t-test was used to compare mean differences between the two groups. The results for the experimental group indicated that aerobic dance did not lead to a statistically significant reduction in percent body fat ( $p=0.472$ ). Similarly, the control group showed no statistically significant reduction ( $p=0.520$ ). In conclusion, the aerobic dance programme did not lead to a significant reduction in body fat for this population. However, high body fat remains a risk factor for hypertension. Future studies should explore additional factors, such as dietary influences, to better assess their effects on body composition and hypertension risk.

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## Introduction

Hypertension which is defined as systolic blood pressure level  $\geq 140$  mmHg and diastolic blood pressure level  $\geq 90$  mmHg (Mirzaei et al., 2020), is a significant health issue globally affecting 1.5 billion people (Charchar et al., 2024). It contributes majorly to the global burden of disease worldwide (GBD 2019 Risk Factors Collaborators, 2020) and is accountable for nearly 10.8 million premature annual deaths. Elevated levels of percent body fat (%BF) have been identified as a contributing factor to the onset of hypertension (Calling et al., 2006; Cohen & Spiegelman, 2015; Park et al., 2019). Hypertension

majorly contributes to cardiovascular events which are the top killer diseases globally (Forouzanfar et al., 2017) and plays a role in the development of additional health issues including kidney disease, blindness, stroke and peripheral arterial disease among others (Fuchs & Whelton, 2020). It does not only affect health, but it also has an important financial burden on persons, families, communities, and medical systems (Murphy et al., 2020; Wierzejska et al., 2020). The required treatment, prolonged care and output losses that come as a result of hypertension hamper social and economic development (Brathwaite, 2021).

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In Africa, hypertension is high with global highest prevalence rate among adults at approximately 46% (Bosu et al., 2019; Mills et al., 2017; Okello et al., 2020). In Uganda, hypertension is a major mortality hazard factor among adults responsible for 20% deaths (WHO, 2018) with a high prevalence among adults 18 years and older estimated between 26.5% (Guwatudde et al., 2015) and 31.5% (Lunyera et al., 2018). The major causes of hypertension in Uganda include mismanagement caused by behavioral factors and insufficient knowledge (Chang et al., 2019; Green et al., 2020). Most Ugandans find it difficult to afford hypertension medication because it is expensive and limited to health facilities and pharmacies in urban areas (Armstrong-Hough et al., 2018; Green et al., 2020; Green et al., 2020). The diagnosis, treatment and management costs of hypertension in Uganda affect people, households, societies, and the government (Murphy et al., 2020) emphasizing the pressing need to address the factors that contribute to its prevalence (Dzau & Balatbat, 2019).

Exercise has been shown to be one of the methods effective for reducing percent body fat (Cakmakc et al., 2011). Aerobic exercise has been found to deliver numerous health benefits including increased energy and lipid utilisation which aid in fat and weight loss (Muscella et al., 2020), improved arterial stiffness and endothelial function (Gong & Liu, 2021), increased nitric oxide and nitrite oxide production (Arefirad et al., 2022; Tsukiyana et al., 2017) among others that may in turn reduce hypertension. Numerous studies globally have shown positive effects of aerobic exercise on percent body fat. For instance, Pantelic and colleagues (Pantelic et al., 2013) investigated the effects of aerobic dance exercises on body composition parameters in young women and found a significant decrease in percent body fat from 22.66% to 20.37%. Cakmakcı et al. (2011) also investigated the effects of aerobic dance exercises on body composition in sedentary women and found a significant reduction in percent body fat. Octaviana and colleagues also found that low impact aerobic dance significantly reduced the percent body fat in obese women (Octaviana et al., 2020). The reducing effect of aerobic dance exercise on percent body fat of stage one hypertensive adults as a contributing factor to hypertension in Africa has barely been investigated. There is inadequate information on the impact of structured aerobic dance on percent body fat of stage one hypertensive adults in Uganda. This study

therefore sought to bridge this data gap by using a structured 12-week aerobic dance programme to investigate its reducing effect on percent body fat of stage one hypertensive adults aged 30-59 years.

## Methods

### Study Design

A pre-post-test experimental research design was utilised in this study. Random assignment was used to assign participants into either the experimental or control groups. Stage one hypertensive adults attending Kyambogo University Medical Centre participated in this study. The details of the study were fully explained to the participants. The institute review board of St Mary's Hospital Lacor, Gulu (LHIREC NO: 0196/12/2021) and the Uganda National Council for Science and Technology (reg.No: HS2202ES) approved this study. The participants provided written consent before taking part in the study. The study was conducted in accordance with the code of Ethics of the World Medical Association (Declaration of Helsinki). The participants in the experimental group participated in a moderate intensity aerobic dance programme thrice a week, 45 minutes per session for a duration of 12 weeks. Participants in the control group maintained their normal routines but they were followed up weekly to ensure they remained part of the study.

### Sample Size Calculation

The sample size was calculated using G\*power statistical software tool (version 3.1.9.4) that is widely regarded as a reliable tool for calculating sample size in experimental studies (Erdfelder et al., 1996; Neuha et al., 2023) before the study. The two tails, an effect size of 0.8, an error probability of 0.05 and a power of 80% were the input parameters in the software. The statistical test that was chosen to compare the differences between the two independent means was a two-group t-test. The sample size that was suggested was 26 participants in each group making a total of 52 participants in each group. A total of six participants was added to cater for the dropouts making a total of 58 participants. The power of 80% was used as it is accepted in most experimental studies (Bausell & Li, 2002) and a total of 36 participants out of 58 completed the study.

## Participants

Both male and female participants aged 30-59 years in stage one hypertensive category were purposively sampled to participate in this study. The study recruited stage one hypertensive adults who were not involved in any structured physical activity programme in the last six months. The study excluded physically challenged and pregnant participants due to possible risks and the possibility of not operating within the required programme. The study also excluded participants who were in stage hypertension category and those with other medical conditions. All the participants were entirely free to participate, refuse, or withdraw from the study at any time, without any consequences. The study was conducted in strict adherence to the ethical principles outlined in the Declaration of Helsinki.

## Percent Body Fat Measurements

A Tanita body composition monitor, model BC-731, manufactured by Tanita Corporation based in Tokyo, Japan, was utilized to assess the percent body fat of the participants at baseline and after the programme. Tanita body composition monitor was chosen because it has been proven to be valid and reliable in testing percent body fat (Kelly & Metcalfe, 2012). Before the measurement was taken, the required data was inputted into the scale to ensure proper interpretation. The participant was required to step onto the platform with bare feet and clean soles of the feet. The heels of the participant were correctly aligned with the electrodes on the measuring platform and the participant stood in a stable position without bending the feet and when in the right position. After the measurement was taken, readings were automatically displayed and recorded.

## Aerobic Dance Programme

Participants in experimental group participated in a 12-week aerobic dance programme. Training was done following the frequency, intensity, time, and type of exercise (FITT) principle. The training was done thrice a week, 45 minutes per session at a moderate intensity which was considered safe for the participants. The five aerobic dance phases that included warm-up, aerobics phase, standing cool down, muscle strengthening and relaxation phases were performed in every session. The control group participants maintained their normal routines but they were followed up to ensure that they remained part of the study. The study participants were

monitored by a professional nurse weekly to ensure that blood pressure remained within the range.

## Data Analysis

The Statistical Package for Social Sciences, version 20.0 was used to analyze data in this study. A p-value of  $\leq 0.05$  was considered statistically significant. In order to compare mean differences of the two groups from baseline to post tests, a paired-sample t-test was used to assess the mean differences and provide the evidence on the effects of the programme on percent body fat.

## Results

### Background Characteristics of the Study Participants

The experimental group had equal numbers of both male (50%) and female (50%) participants whereas the control group had more male (66.7%) than female (33.3%) participants. The age range for all the participants was within the required age group of 30-59 years for both groups. More background characteristics of the study participants are presented in Table 1.

### Percent Body Fat in Stage One Hypertensive adults

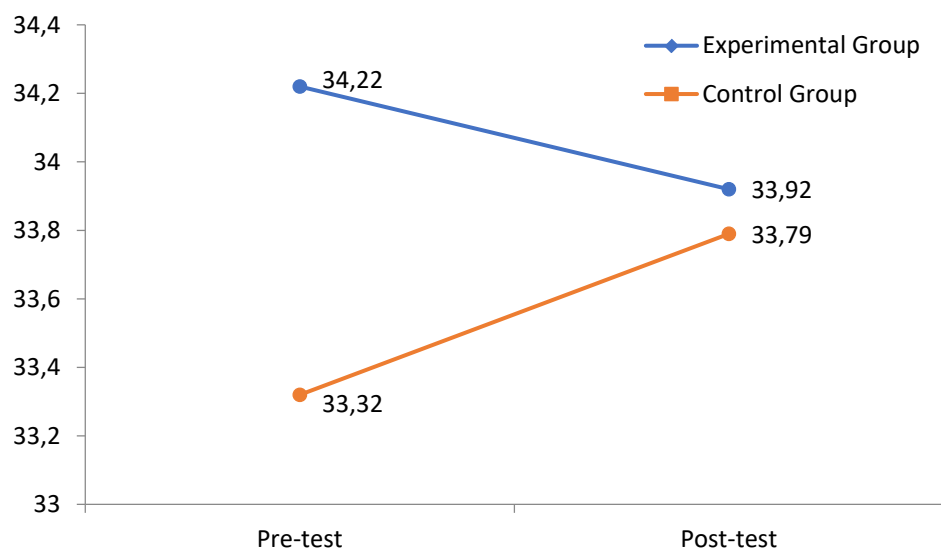
This sought to establish the percent body fat readings for the experimental and control groups for both the pre test and post test assessments. Figure 1 shows the difference in reduction between the experimental and control groups.

Pre-test and post-test results, changes and comparisons of % Body Fat are presented in Table 2. The results show a reduction in percent body fat of 0.30% in the experimental group, whereas the control group exhibited an increase of 0.47% between the pre-test and post-test measurements. The difference between groups in the post-test was 0.13%, a value that is lower than the difference between groups in the pre-test, which was 0.9%. This indicates that the difference between groups decreased by 0.77%.

The t-test analysis revealed that the experimental group did not achieve statistical significance, with a p-value of 0.47 ( $p > 0.05$ ). Similarly, the control group also showed no statistically significant difference, with a p-value of 0.52 ( $p > 0.05$ ). These results indicate that the aerobic dance intervention in this study did not result in a statistically significant reduction in percent body fat among adults with stage one hypertension.

**Table 1**  
Demographic information of the study participants.

Variables	Parameters	Experimental Group		Control Group	
		n	%	n	%
Marital Status	Married	12	66.7	18	100.0
	Single	5	27.8	0	0.0
	Divorced	1	5.6	0	0.0
	Total	18	100.0	18	100.0
Education Level	Secondary	1	5.6	1	5.6
	Diploma	3	16.7	7	38.9
	Bachelor	9	50.0	4	22.2
	Masters	3	16.7	5	27.8
	PhD	2	11.1	1	5.6
	Total	18	100.0	18	100.0
Position at the Centre	Staff	14	77.8	10	55.6
	Student	3	16.7	8	44.4
	Member	1	5.6	0	0.0
	Total	18	100.0	18	100.0



**Figure 1.** Percent body fat comparison between experimental and control groups.

**Table 2**  
Changes of %BF in experimental and control groups.

Groups	Pre-test		Post-test		Change		t	df	p
	Mean	SD	Mean	SD	Mean	SD			
Experimental Group	34.22	8.01	33.92	8.59	0.3	1.73	.735	17	.472
Control Group	33.32	9.95	33.79	9.22	-0.47	3.05	-.657	17	.520

## Discussions

The present study aimed at examining whether a 12-week aerobic dance programme could trigger a reduction of percent body fat of stage one hypertensive adults. We found that aerobic dance does not statistically significantly reduce the percent body fat of participants in the experimental group. We also found that at the completion of 12 weeks of aerobic dance, the percent body fat of participants in the control group slightly increased.

The findings that the percent body fat did not reduce significantly after 12 weeks of aerobic dance programme are similar to those in a study by Silva et al. (2014) who examined the effects of aerobic exercise on the body composition of overweight adolescents for 12 weeks. They found that percent body fat did not reduce significantly. They explained that there was absence of a dietary recall instrument to enable potential exclusion of subjects who may have changed their dietary habits which explained the trend towards increased triglycerides in experimental group. These results may also be attributed to the fact that studies that examined combined effect of aerobic exercise and nutrition on body composition found significant results of percent body fat (27-29). Therefore, observed insignificant reduction in percent body fat may be attributed to failure to control additional triggers of fat gain such as diet.

Several studies have concluded that there is a significant reduction of percent body fat across varying population groups across the world. However, such studies had methodological differences which might explain the different results from what we found. For instance, Nagy & Hantiu (2017) used step aerobics, pilates and strength training, thrice a week, 60-90 minutes for 12 months working with adult women. Their results could be attributed to the long duration of the programme which took 12 months compared to our study that took only 12 weeks and longer training sessions that lasted for 60-90 minutes compared to our study where training sessions lasted for only 45 minutes. Hsu et al., (2019) investigated the effect of aerobic, resistance, and a combination of aerobic and resistance exercise on body composition in adults with sarcopenic obesity. They found a significant reduction in percent body fat. These results could be attributed to differences in training methods as the

biggest reduction was achieved with resistance method compared to our study that used aerobic dance.

Dogra et al. (2022) also used a low-high intensity daily structured physical activity programme to investigate the effects of aerobic intervention on body composition in Obese females. Their study revealed a significant reduction in percent body fat. These results could be attributed to the fact that significant reduction in fat loss occurs with a higher intensity of training compared to our study that used moderate intensity of training. Similarly Umamaheswari et al., (2017) examined the effect of exercise intensity on body composition of 72 sedentary, overweight and obese individuals. Their study investigated the effect of moderate intensity versus high intensity on body composition parameters including percent body fat for a duration of 15 weeks, 40 minutes per session for moderate intensity, 50-74% of heart rate maximum reserve and 20 minutes per session for high intensity training at 75-84% of heart rate maximum reserve. Results from their study revealed that there was a significant reduction in percent body fat after the intervention in the moderate intensity and high intensity training groups. These results however, showed that 15 weeks of high intensity exercise training is more effective in reducing percent body fat compared to moderate intensity exercise training. The group that was exercising within the same intensity as the current study (moderate) had a lower reduction in percent body fat compared to the group that was exercising at high intensity training. The lower reduction in percent body fat in the current study may be attributed to the fact that the study duration was shorter compared to their study and the training intensity was moderate instead of high intensity that leads to greater reductions.

Rankin (2015), Ross et al. (2020), and Wu et al. (2024) investigated the combined effect of aerobic exercise and diet on body composition and their study revealed that emphasizing both exercise and diet was effective in lowering percent body fat significantly. Perhaps a possible reason as to why our results were insignificant was on exclusion of control of diet which these studies have shown as a critical component in their studies.

## Conclusions

It can be concluded that a 12-week aerobic dance programme did not statistically significantly reduce the percent body fat for the participants contrary to the



findings by other studies which coupled the exercise programme with diet programme, used high intensity training and longer duration. Perhaps future studies should consider adjustments of the programme parameters such as training intensity and duration coupled with controlled diet and the use of different assessment methods which could present different results for this population. Future studies can also consider including behavioral adjustments and psycho-sociological factors as part of the intervention.

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## Authors' Contribution

Study Design: LN, KEB, CANN, LJW; Data Collection: LN; Statistical Analysis: MM, LN; Manuscript Preparation: LN, EKB, CANN, MM and LJW

## Ethical Approval

The study was approved by St Mary's Hospital Lacor Institute review board in Gulu, Uganda, (LHIREC NO: 0196/12/2021) and the Uganda National Council for Science and Technology (HS2202ES). The study was carried out in accordance with the code of Ethics of the World Medical Association also known as a declaration of Helsinki.

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## Conflict of Interest

The authors hereby declare that there was no conflict of interest in conducting this research.

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