



A Cross-Over 10 Obese Participant Pilot Study on the Effect of Brisk-Walking, 16:8 Intermittent Fasting, and Zumba on Fasting Blood Glucose, Blood Pressure, and Body Fat Percentage

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ABSTRACT

Obesity remains a major global health concern, contributing to metabolic complications such as insulin resistance, hypertension, and cardiovascular diseases. To mitigate these risks, this pilot crossover study examined the comparative effects of three lifestyle interventions—brisk walking, 16:8 intermittent fasting, and Zumba—on fasting blood glucose, blood pressure, and body fat percentage in obese adults. 10 participants (BMI ≥ 30 kg/m², aged 25-28 years) from Assam, India, completed three 21-day intervention phases, each separated by a two-week washout period. Brisk walking consisted of 4-weekly sessions of 45 minutes at 60-70% of the maximal heart rate, intermittent fasting, and restricted caloric intake to an 8-hour window daily. Zumba involves instructor-led aerobic dance sessions four times per week. Pre- and post-test measures of fasting blood glucose, systolic and diastolic blood pressure, and body fat percentage were assessed using standardized procedures, with data analysed for normality followed by ANOVA or Kruskal-Wallis tests. Across all interventions, favourable reductions in fasting glucose were observed- brisk walking (121.67 to 116.83 mg/dL), intermittent fasting (121.20 to 113.89mg/dL), and Zumba (122.56 to 116.96 mg/dL)- alongside a modest decline in blood pressure and body fat. Despite the positive trends, no significant between-group differences were found ($p > 0.05$), indicating comparable efficacy. Overall, the findings suggest that brisk walking, intermittent fasting, and Zumba are feasible, accessible, and beneficial for obese individuals, promoting improvements in glycaemic control, cardiovascular parameters, and body composition. Although limited by a small sample size, the study highlights the potential of low-cost, sustainable interventions in managing obesity-related metabolic risks.

Keywords: 16:8 Intermittent Fasting, Zumba, Brisk-Walk, Fasting Blood Glucose, Body Fat Percentage, Blood Pressure, and Obese Population.

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INTRODUCTION

Due to the shift in dietary patterns and a lack of physical activity, obesity has emerged as a worldwide health concern, with its prevalence increasing in recent decades (1,2). As per, Katzmarzyk & Mason, [4] contributors of metabolic diseases, such as hypertension, type 2 diabetes mellitus, and cardiovascular diseases, which are leading causes of morbidity and mortality globally, have been closely associated with this rise. Effective lifestyle and public health interventions are desperately needed, as epistemological studies indicate that obese people are much more likely to develop dyslipidemia, insulin resistance, and systemic inflammation [5]. As per Tremmel et al., (6), Adult obesity rates have reached alarming heights, with over 2.1 billion people worldwide, nearly 20% of the world's population, being classified as overweight or obese, with obesity alone accounting for over 5% of all deaths globally. Economically, the cost of obesity is enormous: less productivity and a cost of US \$2 trillion in health costs a year, or 2.8% of

global GDP. These figures highlight the fact that obesity is a major social issue that is affecting economies all over the world and destroying human potential. Combining tailored dietary changes with regular physical activity improves weight, fat reduction, and produces better improvements in body composition than diet alone (7). Additionally, structured workouts, whether high-intensity, strength-based, or endurance-focused, promote long-term weight management and offer metabolic and cardiovascular benefits that are independent of weight loss. The most convenient approach for managing obesity is through lifestyle interventions based on flexibility, adherence, and overall well-being.

A series of metabolic disruptions is facilitated by obesity: excess adiposity increases hepatic gluconeogenesis and prolongs fasting hyperglycemia by suppressing insulin-mediated glucose uptake and impairing insulin signaling (8). At the same time, increased body fat elevates blood pressure by mechanisms such as renin-angiotensin system activation, endothelial dysfunction, and sympathetic hyperactivity (9). Additionally, Vaneckova et al., (2014), study revealed that increased body fat percentage, especially in visceral reserves, further compounds these risks by promoting vascular stiffness and inflammation, which in turn reinforces hyperglycemia and hypertension. Blood Pressure, Body Fat Percentage, and Fasting Blood Glucose all provide important insights into cardiometabolic health. Based on a meta-analysis of Zhang et al., (2017), relationships between greater HOMA-IR and mortality risk in individuals without diabetes, elevated fasting glucose reflects underlying insulin resistance and predicts future cardiovascular mortality. Chronically elevated blood pressure, particularly in obese populations, signals vascular stress and is associated with early metabolic dysfunction and increased insulin resistance (12). Insulin resistance and systemic inflammation are caused by excess body fat, especially visceral adiposity, which predicts metabolic syndrome more accurately than general adiposity (13,14). Together, these biomarkers form a comprehensive portrait of obesity-related cardiometabolic risk.

A highly accessible form of aerobic activity, brisk walking is especially beneficial for obese people because it enhances glucose metabolism, supports cardiovascular health, and helps people manage their weight by reducing inflammation and improving oxygen delivery (Women & Home). Meanwhile, randomized trials and meta-analyses have demonstrated that the 16:8 intermittent fasting (IF) regimen, which consists of a daily cycle of 16 hours of fasting followed by an 8-hour window for eating, lowers fasting blood glucose, lowers diastolic blood pressure, and encourages positive changes in body weight and composition in adults who are overweight or obese (16,17). Additionally, Zumba also provides a fun, dance-based, high-intensity workout that encourages adherence; even with no weight reduction, it dramatically reduced systolic and diastolic blood pressure and lipid levels in obese inactive women in pilot studies (Araneta & Tanori, 2015).

Objectives of the Study

1. To assess the effect of Brisk-Walk, 16:8 Intermittent Fasting, and Zumba on Fasting Blood Glucose of obese participants.
2. To assess the effect of Brisk-Walk, 16:8 Intermittent Fasting, and Zumba on the Systolic & Diastolic Blood Pressure (BP) of obese participants.
3. To assess the effect of Brisk-Walk, 16:8 Intermittent Fasting, and Zumba on Body Fat Percentage of obese participants.

Significance of the Study

This pilot study assesses the comparative and combined effects of three practical, affordable, and sustainable lifestyle interventions, Brisk-Walk, 16:8 Intermittent Fasting, and Zumba, on important cardiometabolic markers in obese adults. By employing a crossover design with 10 obese participants, the study provides preliminary evidence on feasibility, adherence, and short-term efficiency, which may guide larger random trials. Additionally, it emphasizes lifestyle changes as a crucial component in reducing the health risks associated with obesity.

MATERIAL AND METHODS

Study Design: This study employed a crossover pilot design to evaluate the short-term effects of Brisk Walk, 16:8 Intermittent Fasting, and Zumba on fasting blood glucose, blood pressure, and body fat percentage in obese adults. The cross-over model was selected to minimize inter-individual variability and improve statistical sensitivity in a limited sample size by enabling each participant to act as their own control.

Participants: A total of 10 obese individuals ($BMI \geq 30 \text{ kg/m}^2$), aged between 25 to 28 years, were selected through purposive sampling from the local community of Guwahati, Assam, India. Inclusion criteria included that participants had to be medically cleared for moderate-intensity physical activity, free of serious metabolic or cardiovascular complications, and not actively involved in a structured exercise or diet schedule. Pregnancy, smoking, chronic conditions requiring medication modifications, and non-adherence to food or exercise regimens were among the exclusion criteria.

Interventions: Three interventions were administered sequentially, with each phase lasting 21 days and separated by a two-week washout period to minimize carryover effects.

1. **Brisk Walking:** Participants engaged in 45 minutes of brisk walking at 60 to 70% of their maximum heart rate, 4 days/week.
2. **16:8 Intermittent Fasting:** Participants followed a fasting regimen, restricting caloric intake to an 8-hour window (10:00-18:00 hrs) while consuming only herbal tea, water, or black coffee during fasting hours. Although there were no calorie restrictions during the dining window, participants were encouraged to eat balanced meals.
3. **Zumba:** Participants attended instruction-led Zumba classes four days a week that combined interval training and aerobic dancing to keep heart rates between 65 to 75% of maximum HR.

Outcomes Measured:

1. Fasting Blood Glucose (FBG): Measured using a standardized glucometer after an overnight fast of 10 hours.
2. Blood Pressure (BP): Measured using a digital automated sphygmomanometer following a 10-minute seated rest from 7:00 to 8:30 am.
3. Body Fat Percentage: Assessed using bioelectrical impedance analysis (BIA) under standardized conditions (hydration status and pre-measure fasting).

Procedures: Before the initial intervention, baseline assessments of every outcome variable were recorded. Participants completed the same post-test evaluations at the conclusion of each 21-day intervention phase. Before moving on to the next intervention, washout periods were used to ensure that the body returned to its baseline. To improve compliance, physical activity trackers, dietary adherence diaries, and attendance logs were kept.

Statistical Analysis: The IBM SPSS Version 27 was used for the statistical analysis of the data. First, the nature of the data measured during pre- and post-test was explained using descriptive statistics (mean and standard deviation). Then the normality of the data was checked using the Shapiro-Wilk test at a 0.05 significance level. Later, based on the *p-value* of the Shapiro-Wilk test, One-Way ANOVA (Analysis of Variance) or Kruskal-Wallis' test was used at 0.05 significance for further analysis.

RESULTS

Variables	Brisk Walk		16:8 Intermittent Fasting		Zumba		Shapiro-wilk (Post Test)	<i>p</i> -value	Test Used (Post Test)	<i>p</i> -value
	Pre (M ± SD)	Post (M ± SD)	Pre (M ± SD)	Post (M ± SD)	Pre (M ± SD)	Post (M ± SD)				
Fasting Blood Glucose	121.67 ± 5.38	116.83 ± 4.71	121.20 ± 5.16	113.89 ± 5.28	122.56 ± 6.50	116.96 ± 8.07	.928	.043	Kruskal-Wallis	.351
Blood Pressure (BP)										
Systolic BP	131.76 ± 8.66	127.24 ± 9.58	129.36 ± 6.28	125.83 ± 5.88	130.62 ± 7.55	125.81 ± 7.19	.958	.282	ANOVA	.894
Diastolic BP	85.47 ± 5.48	83.66 ± 5.85	85.13 ± 4.11	82.50 ± 5.12	85.56 ± 5.10	82.28 ± 5.64	.980	.826	ANOVA	.834
Body Fat Percentage	35.20 ± 4.13	34.83 ± 4.20	34.82 ± 4.22	33.71 ± 4.01	34.88 ± 4.11	33.94 ± 4.20	.965	.406	ANOVA	.817

Table No. 1: Descriptive Statistics, Test of Normality, & Inferential Statistics of Study Variables across three different interventions

As per Table No. 1, all three interventions demonstrated modest decreases in fasting blood glucose from pre- to post-test. Brisk walking reduced glucose from 121.67 ± 5.38 mg/dL to 116.83 ± 4.71 mg/dL, 16:8 intermittent fasting lowered it from 121.20 ± 5.16 mg/dL to 113.89 ± 5.28 mg/dL, and Zumba decreased values from 122.56 ± 6.50 mg/dL to 116.96 ± 8.07 mg/dL. Despite these improvements, the Kruskal-Wallis test did not reveal significant differences across interventions (*p* = .351), suggesting that while each strategy effectively reduced glucose levels, no single approach outperformed the others within this pilot sample. Body fat percentage demonstrated slight but consistent reductions across all groups. Participants in the brisk walking condition decreased from 35.20 ± 4.13% to 34.83 ± 4.20%, those in the intermittent fasting condition from 34.82 ± 4.22% to 33.71 ± 4.11%, and those in the Zumba group from 34.88 ± 4.11% to 33.94 ± 4.20%. Despite these trends, ANOVA yielded no significant differences among interventions (*p* = .817), suggesting all three approaches supported modest body fat reductions without one emerging as superior.

Participants experienced reductions in systolic pressure across interventions. Brisk walking lowered SBP from 131.76 ± 8.66 mmHg to 127.24 ± 9.58 mmHg, intermittent fasting reduced it from 129.36 ± 6.28 mmHg to 125.83 ± 5.88 mmHg, and Zumba decreased it from 130.62 ± 7.55 mmHg to 125.81 ± 7.19 mmHg. ANOVA testing showed no significant between-group effects ($p = .894$), indicating that each method was comparably effective in promoting modest improvements in systolic control. Similar downward trends were observed in diastolic measures. Brisk walking reduced DBP from 85.47 ± 5.48 mmHg to 83.66 ± 5.85 mmHg, intermittent fasting from 85.13 ± 4.11 mmHg to 82.50 ± 3.52 mmHg, and Zumba from 85.56 ± 5.10 mmHg to 82.28 ± 5.64 mmHg. Again, ANOVA results indicated no significant differences across interventions ($p = .834$), highlighting that each approach exerted comparable effects on diastolic blood pressure reduction.

Zumba, intermittent fasting, and brisk walking all resulted in modest but positive improvements in blood pressure, body fat, and glucose levels. However, the cross-over pilot design and small sample size are also responsible for the lack of statistically significant between-group differences. Crucially, these results suggest that all three lifestyle choices may be effective in managing obesity, and they could be useful in tailoring interventions to individual adherence and preferences.

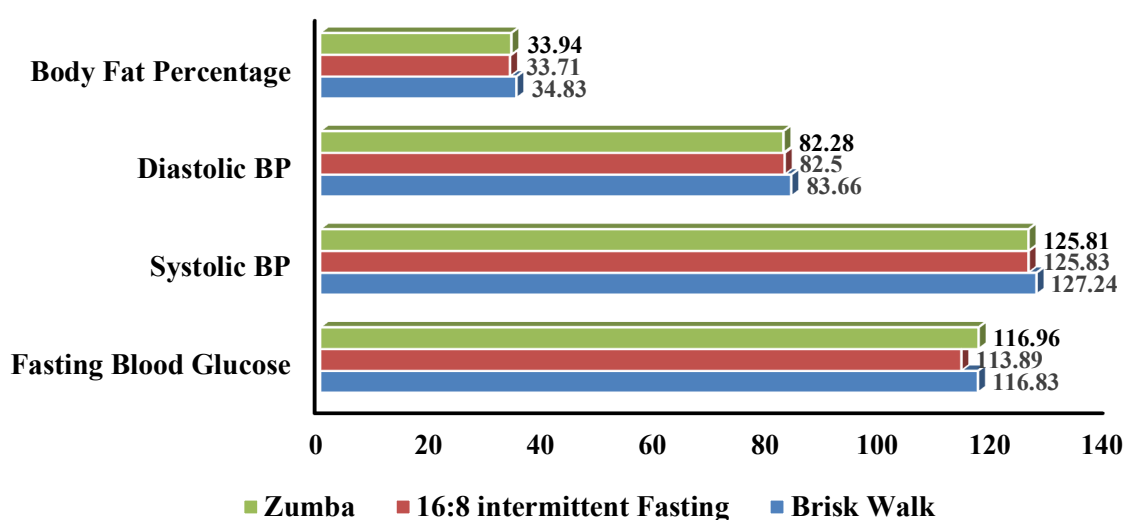


Figure No. 1: Graphical representation of the Post-Test means of Body Fat Percentage, Blood Pressure, & Fasting Blood Glucose after the 21-day Interventions.

DISCUSSION

The results of this pilot study indicate that Zumba, 16:8 intermittent fasting, and brisk walking all contributed to moderate reductions in blood pressure, body fat percentage, and fasting blood glucose levels among obese individuals. The steady downward trends are encouraging and consistent with previous evidence that lifestyle-based treatments are beneficial in improving cardiometabolic health, even though the changes did not achieve statistical significance. For example, it has been demonstrated that regular brisk walking improves insulin sensitivity and lowers cardiovascular risk factors in persons who are overweight (17). Similarly, it has been noted that intermittent fasting regimens, especially time-restricted meals, enhance blood pressure and fasting glucose while promoting weight control (18). Zumba, a high-intensity aerobic workout, has also been shown to improve blood pressure, lipid profiles, and body composition, particularly in sedentary and obese individuals (19).

The small sample size and brief intervention period, which are typical limitations in pilot trials, are probably to blame for the study's lack of substantial between-group differences. However, the results demonstrate the viability of using a variety of low-cost, recreational, and lifestyle interventions to control obesity. Crucially, the similar advantages of many therapies imply that adherence and individual preference might be decisive factors in maintaining long-term behaviour change (20). Future larger-scale randomized trials with extended follow-up are warranted to validate these results, examine mechanistic pathways, and identify which subgroups may benefit most from specific interventions.

CONCLUSION

In this cross-over pilot trial, it was demonstrated that Zumba, 16:8 intermittent fasting, and brisk walking all contributed to obese participants experiencing modest but positive reductions in blood pressure, body

fat percentage, and fasting blood glucose. The continuous decreasing trends across all interventions, despite the lack of statistical significance between-group differences, demonstrate the potential of accessible, low-cost lifestyle strategies in reducing cardiometabolic risks. The absence of significant findings can be attributed to the small sample size and short intervention duration, yet the outcomes reinforce the feasibility and acceptability of these approaches. Importantly, the study emphasizes how a variety of lifestyle choices, from structured diets and recreational group activities to organized aerobic exercises, can encourage people to embrace long-term health habits.

LIMITATIONS OF THE STUDY

The findings of this study should be interpreted with caution due to several limitations. Foremost, the small sample size of only ten participants limits statistical power and generalizability to broader obese populations. The short intervention period of 21 days for each phase may not have been sufficient to capture the long-term metabolic adaptations of lifestyle changes. Potential carryover effects, despite the washout periods, cannot be fully ruled out in a crossover design.

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AUTHORS' CONTRIBUTION

Manish Acharjee conceptualized and designed the study, conducted the data collection, performed statistical analysis, and drafted the initial manuscript. Priyanshu Prabal Dutta and Reshma Rai contributed to the methodological framework, data interpretation, and literature review. Roza Gurung, H. Lalremsangi, and Deepanshu Singa assisted in participant coordination, intervention supervision, and data entry. All authors collaboratively reviewed the results, contributed to manuscript revision, and approved the final version for submission.

Ethical Standard & Informed Consent: Before data collection, the Institutional Ethics Committee of the Department of Physical Education of Punjabi University, Patiala, Punjab granted ethical approval for the study protocol.

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