

Effects of Structured Step Aerobics Combined with Psycho-Social Coping on Body Mass Index and Perceived Stress among Overweight Female Undergraduates in Zaria, Nigeria: A Randomised Controlled Trial

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Abstract

Being physically inactive, having too much body weight, as well as psychological stress is common among female university students in Northern Nigeria with limited controlled trials that have investigated integrated exercise and coping interventions in this population. This study assessed the effect of an eight-week structured step aerobics programme combined with weekly psycho-social coping sessions on body mass index (BMI) and perceived stress among overweight female undergraduates of the Federal University of Education (FUE), Zaria. Eighty sedentary female undergraduates (BMI 25.0–29.9 kg/m²; Perceived Stress Scale-10 [PSS-10] score $\geq$ 20) were randomly assigned to an experimental group (three 45-minute step aerobics sessions and one 60-minute coping seminar weekly) or a usual-routine control group ($n = 40$ each). BMI was calculated from weight and height measured with calibrated instruments, and perceived stress was measured with the PSS-10. Analysis of covariance (ANCOVA) and multivariate ANCOVA (MANCOVA) were used at $\alpha = .05$. Seventy-five participants (93.8%) completed the trial. After adjustment for pre-test scores, the experimental group had a lower BMI (adjusted $M = 26.39$ vs. 27.20 kg/m²; $F(1, 72) = 46.09$, $p < .001$, partial $\eta^2 = .39$) and lower perceived stress (adjusted $M = 18.88$ vs. 24.40 ; $F(1, 72) = 35.23$, $p < .001$, partial $\eta^2 = .33$) than the control group, and the multivariate effect of group on the combined outcomes was significant (Wilks' $\Lambda = .48$, $p < .001$). The combined programme was associated with significant reductions in BMI and perceived stress relative to the usual-routine control; the contributions of the two components cannot be separated. Supervised, female-only, indoor exercise-and-coping programmes merit consideration in university wellness services in similar settings.

Keywords: Step Aerobics, Body Mass Index, Perceived Stress, Female Undergraduates, University Students, Health Promotion.

Introduction

Excess body weight and physical inactivity are among the greatest public health problems of the 21st century. In 2022, an estimated 31.3% of adults worldwide were insufficiently active, and women were more likely than men not to meet the recommended level of activity (Strain et al., 2024). By that time, over one billion people were estimated to be living with obesity (NCD Risk Factor Collaboration [NCD-RisC], 2024). Nigeria reflects these

trends. From a meta-analysis of 35 studies, the pooled prevalence of overweight and obesity among adults in Nigeria was reported as 25.0% and 14.3% respectively, with obesity being more prevalent in women (19.8%) than in men (12.9%) (Adeloye et al., 2021). Adults are recommended to accumulate 150 to 300 minutes of moderate-intensity aerobic activity per week (Bull et al., 2020); a sedentary student will not achieve this threshold without a structured programme.

The transition to university is accompanied by new academic, financial, and social demands, and a high level of perceived stress is common among university students. In a cross-sectional study of 471 Nigerian undergraduates conducted during the COVID-19 lockdown period, 13.6% of the respondents reported low stress, while 62.0% and 24.4% reported moderate and high stress respectively (Ubani et al., 2023). Stress and adiposity are interconnected: chronic stress can increase adiposity through neuroendocrine and behavioural mechanisms, such as altered cortisol responses and increased consumption of energy-dense foods (Adam & Epel, 2007; Tomiyama, 2019). Weight management and stress management should therefore not be considered separately but as a combined problem.

It may be even harder for female undergraduates in northern Nigeria to be active. A cross-cultural narrative review of 18 studies identified time constraints, sociocultural norms regarding public exercise and clothing, and limited facilities as common barriers to physical activity for female students (Zhou & Liu, 2025). These constraints are likely to be heightened in conservative and resource-limited contexts, indicating that women-only indoor sport programmes could be more acceptable in such settings than outdoor sport. Step aerobics, which involves stepping onto and off an adjustable platform to music, is appropriate for such situations because it is a group activity, needs little space, and can be varied in intensity through the height of the platform and the tempo of the music.

There is some promising evidence supporting step-based and similar aerobic programmes for young women. A 12-week step aerobics programme three times weekly produced greater improvements in body composition than a sedentary control in a two-group study of 94 young women (Spirtović et al., 2024). Aerobic dance circuit training reduced body fat percentage in 70 female students of Colleges of Education in Nigeria (Ajayi & Moses, 2024). Physical activity has also proven beneficial for mental health: meta-analyses of physical activity interventions with university students have shown reductions in stress, anxiety and depression (Huang et al., 2024; Liu et al., 2025). The certainty of this evidence is, however, constrained by heterogeneity, risk of bias and the paucity of theory-informed designs (Huang et al., 2024), and most trials focus on weight or mental health alone. To address this empirical gap, the absence of structured preventive fitness and stress-management provisions in a university health service oriented toward clinical care — this randomised controlled trial was conducted.

Statement of the Problem

Overweight, physical inactivity and high perceived stress are well documented among Nigerian university students, particularly women (Adeloye et al., 2021; Ubani et al., 2023), and sociocultural constraints restrict female participation in conventional campus sport (Zhou & Liu, 2025). Yet university health services in Nigeria are predominantly curative: they manage clinical illness and rarely offer structured preventive fitness or stress-management programmes. Within this context, there is limited experimental evidence from Nigeria's North-West geopolitical zone on interventions that combine supervised exercise with psycho-social coping training for female undergraduates, and no such evidence from the Federal University of Education, Zaria. The consequences of leaving this gap unaddressed include continued weight gain and stress-related ill health during a formative life stage, with attendant risks of cardiometabolic disease, burnout and academic disengagement. The problem addressed by this study is therefore whether a supervised, women-only, indoor programme combining structured step aerobics with psycho-social coping sessions can improve BMI and perceived stress among overweight, sedentary female undergraduates at FUE Zaria, relative to a usual-routine control.

Objectives

The study aimed to (1) determine the effect of an eight-week structured step aerobics programme, delivered together with psycho-social coping sessions, on the BMI of overweight female undergraduates; (2) evaluate the effect of the same combined programme on reduction in perceived stress; and (3) assess whether the combined programme produces significantly better overall outcomes (BMI and perceived stress considered jointly) than a passive, usual-routine control. BMI was designated the primary outcome and perceived stress the secondary outcome; both were retained in the joint multivariate analysis (Hypothesis 3).

Research Questions and Hypotheses

The following research questions guided the study. RQ1: What is the effect of the combined step aerobics and psycho-social coping programme on the BMI of overweight female undergraduates, relative to a usual-routine control? RQ2: What is its effect on their perceived stress? RQ3: Does the programme improve BMI and perceived stress considered jointly? Corresponding null hypotheses were tested at the .05 level of significance. Ho₁: There is no significant difference in post-test BMI between the experimental and control groups after controlling for pre-test BMI. Ho₂: There is no significant difference in post-test PSS-10 scores between the groups after controlling for pre-test PSS-10 scores. Ho₃: There is no significant multivariate difference between the groups on combined post-test BMI and PSS-10 scores after controlling for the corresponding pre-test scores. Because the theoretical framework and the cited meta-analyses predict the direction of effects, the following directional alternative hypotheses were also specified: H₁₁, the experimental group would show lower post-test BMI than the control group; H₁₂, the experimental group

would show lower post-test PSS-10 scores than the control group; and H_{13} , the combined post-test outcomes would favour the experimental group multivariately.

Theoretical Framework and Review of Related Literature

Theoretical Framework

The study draws on three complementary theoretical sources: the General Adaptation Syndrome (GAS; Selye, 1950), Engel's biopsychosocial model (Engel, 1977; Borrell-Carrió et al., 2004), and the transactional model of stress and coping (Lazarus & Folkman, 1984).

The GAS describes the body's reaction to chronic stressors in three phases; alarm, resistance and exhaustion. Students may become unwell or burnt out when chronic academic, financial and environmental stress keeps them in the resistance stage, drawing down adaptive resources. Regular exercise, as a controlled, intermittent stressor followed by recovery, fits more closely with the cross-stressor adaptation hypothesis than with the GAS itself: repeated exposure to exercise is hypothesised to produce physiological adaptations that generalise to other stressors (Sothmann et al., 1996), and physical fitness has been suggested to moderate the impact of stress on health complaints (Gerber & Pühse, 2009). We advance these mechanisms as untested hypotheses for the present trial. According to the biopsychosocial model, health results from the interaction of biological, psychological and social factors (Engel, 1977; Borrell-Carrió et al., 2004), and it informed the design of the intervention. The biological pathway was addressed through increased energy expenditure from aerobic fitness (step aerobics); the psychological pathway was addressed through coping-skills training drawn from the transactional model (Lazarus & Folkman, 1984), focused on the appraisal of stress and coping resources; and the social pathway was addressed through group delivery, peer discussion and supervised sessions in a supportive, women-only environment. Conceptual model: the combined intervention was hypothesised to act through (a) increased energy expenditure and (b) improved stress appraisal, coping resources and social support, leading to lower BMI and lower perceived stress; both outcomes were examined jointly in the MANCOVA.

Step Aerobics, Exercise Dose and Body Composition

Dose of exercise is critical to weight outcomes. In a position stand, the American College of Sports Medicine (ACSM) determined that approximately 150–250 minutes per week of moderate-intensity activity is needed for modest weight loss, while greater volumes are related to clinically significant weight loss (Donnelly et al., 2009). The present programme of three 45-minute sessions, of which approximately 30 minutes comprised stepped choreography, therefore provided about 90 minutes of moderate structured activity per week, below the 150-minute threshold so a modest BMI change over eight weeks was the realistic expectation. Controlled studies in young women report positive effects of step-based programmes on body composition (Spirtović et al., 2024) and of aerobic dance on body fat percentage in Nigerian Colleges of Education students (Ajayi & Moses, 2024). The evidence is not uniformly positive, however: Drobnik-Kozakiewicz et al. (2013) found no

significant change in body composition after ten weeks of step aerobics in young women, which they attributed to the absence of calorie-intake control, a caution directly relevant to the present trial, in which dietary intake was not monitored. The intensity of the present study was set within the heart-rate-reserve and perceived-exertion ranges recommended by the American College of Sports Medicine (Liguori, 2021).

Exercise, Coping Skills and Stress in University Students

A meta-analysis showed that physical activity interventions were effective in reducing stress among students (standardised mean difference = -0.61 ; Huang et al., 2024), and an analysis of 34 studies involving 8,020 students found that physical activity exposure was associated with better mental health outcomes (Liu et al., 2025). Psychological skills training can also help: a meta-analysis of stress-reduction interventions for university students found that cognitive-behavioural, mindfulness and relaxation-based approaches were generally associated with reduced anxiety and stress (Regehr et al., 2013). Synthesising across these streams, aerobic exercise shows consistent but mostly small-to-moderate effects on weight and moderate effects on student stress, while the incremental benefit of adding coping training to exercise remains unclear: few trials combine the two, and fewer still compare the combination with an untreated control.

Methodology

Design

This study was a two-arm (experimental vs. control), parallel-group, pre-test/post-test randomised controlled trial (RCT) with 1:1 allocation (a true experimental design), reported in line with the CONSORT 2010 statement (Schulz et al., 2010). Data collection took place over 10 weeks during the 2025/2026 academic session, comprising baseline measurement, the eight-week intervention, and post-test measurement.

Setting and Population

The study was carried out in an indoor multipurpose sport hall and lecture rooms of FUE Zaria, Kaduna State, in the North-West geopolitical zone of Nigeria. All full-time female undergraduates registered in the University for the study session constituted the target population. The multipurpose sports hall was fitted with standalone battery-powered audio units to avoid disruption from local power failures, portable ventilation fans, and anti-slip rubberised aerobic platforms with lockable risers.

Participants, Eligibility and Sampling

Recruitment proceeded in stages. First, 300 female undergraduate students were approached through class announcements across all faculties and levels and completed the Perceived Stress Scale-10 (PSS-10; Cohen et al., 1983), the short form of the International Physical Activity Questionnaire (IPAQ-SF; Craig et al., 2003), a health history, and the Physical Activity Readiness Questionnaire for Everyone (PAR-Q+; Warburton et al., 2011), while their height and weight were recorded. Eligible participants were those who were

both overweight (BMI 25.0–29.9 kg/m²) according to the World Health Organization (2000) and of at least moderate perceived stress (PSS-10 score ≥ 20), and who were sedentary (IPAQ-SF score < 600 MET-minutes per week), medically fit to exercise, and gave written consent. Exclusion criteria were pregnancy and lactation; known cardiovascular, metabolic (including diabetes, screened by fasting blood glucose at the university health centre) or musculoskeletal disease; use of medication affecting weight or mood; current dieting or structured exercise; and current psychological treatment. Of the 300 students screened, 102 met all criteria. Second, because the number of eligible volunteers exceeded the sample-size requirement (see below), 80 of the 102 eligible students were selected by random lottery and then randomly assigned to groups (Figure 1).

Sample Size

An a priori power analysis for ANCOVA was conducted in G*Power (Faul et al., 2009). Based on a medium-to-large effect ($f = 0.35$), consistent with effect sizes reported in prior aerobic-exercise trials in young women, and a pre-test–post-test correlation of .50 (which raises the effective effect size to $f = 0.40$), with $\alpha = .05$ and power = .80, the required total sample was 51. Allowing 20% attrition, the minimum target was approximately 64 participants; 80 participants were nevertheless recruited to provide a margin above this minimum and to preserve power if attrition proved higher than anticipated (recomputed power is approximately .89 at $n = 66$ and exceeds .94 at the full $n = 80$).

Randomisation, Allocation Concealment and Blinding

A computer-generated random sequence (1:1, permuted blocks of 4) was created by an independent statistician not involved in recruitment. Allocation was concealed in opaque, numbered, sealed envelopes, opened by a research assistant only after baseline measurement. Participants and instructors could not be blinded. Height and weight were measured by assessors blinded to group allocation, and data were analysed by an assessor blinded to group allocation.

Ethical Considerations and Consent Procedures

The study was not approved by an institutional ethics committee, and the trial was not prospectively registered; both are acknowledged as limitations (see the Limitations section). All participants gave written informed consent after the study procedures, the voluntary nature of participation, confidentiality, and the right to withdraw had been explained. Control-group participants were offered the full programme after the week-10 post-test, in line with ethical practice for two-arm trials.

Interventions

Experimental group

Each step session comprised an 8-minute warm-up, 30 minutes of stepped choreography (basic step, knee-up, V-step and L-step patterns), and a 7-minute cool-down including static

stretching. The platform height was set at 10 cm in weeks 1–4, with music at 120 bpm, corresponding to an intensity of 40–59% of heart-rate reserve (light-to-moderate). In weeks 5–8 the platform height was raised to 15 cm and the tempo to 128 bpm, corresponding to 50–70% of heart-rate reserve (moderate intensity) (Liguori, 2021). Step sessions were led by the research assistants, who were trained by the researcher to deliver the standardized session structure and safety protocols described above.

A licensed counselling psychologist delivered the weekly 60-minute coping seminars in four groups of ten. Each seminar followed a fixed structure: a 15-minute didactic introduction to the module's theme, a 30-minute guided experiential component that included scripted diaphragmatic-breathing practice, a written stress-appraisal log and a structured peer discussion, and a 15-minute debriefing; participants completed an assigned weekly self-monitoring exercise recorded in an intervention workbook. Dietary intake and physical activity outside the programme sessions were not monitored.

Control Group

Control-group participants were asked not to begin any new weight-loss or exercise programme and continued their normal campus routine without structured exercise or coping training. For ethical reasons, they were offered the full programme after the week-10 post-test.

Outcome Measures and Instruments

Body Mass Index: Body weight was measured to the nearest 0.1 kg on a calibrated digital scale, which was checked daily against a standard reference weight, and height to the nearest 0.1 cm on a wall-mounted stadiometer. Participants were measured in light clothing, after voiding, in the morning. A third measurement was taken whenever the first two differed by more than 0.2 kg (weight) or 0.5 cm (height); otherwise, the two measurements were averaged. BMI was calculated as weight (kg) divided by height (m) squared. The intraclass correlation coefficient in the pilot was excellent ($ICC = .99$), and the same trained assessors and measurement conditions were used at both time points.

Perceived stress: Perceived stress was measured with the PSS-10 (Cohen et al., 1983), a 10-item self-report instrument assessing the degree to which situations in one's life are appraised as unpredictable, uncontrollable and overloaded. Items are rated on a five-point scale (0 = never to 4 = very often); total scores range from 0 to 40, with higher scores indicating greater perceived stress. The entry threshold of ≥ 20 was used to select participants experiencing at least moderate stress. Adaptations were limited to minor contextual phrases reviewed by a panel of three experts (two in exercise physiology and one in psychometrics); the Scale-Content Validity Index (S-CVI/Ave) was .92. Internal consistency was good: McDonald's $\omega = .87$ (pre-test) and .89 (post-test), and Cronbach's $\alpha = .86$ (pre-test) and .88 (post-test).

Data Analysis

IBM SPSS Statistics version 26 was used. Means and standard deviations described participant characteristics; independent-samples *t* tests and chi-square tests examined baseline equivalence. One-way ANCOVA tested H_{01} and H_{02} with post-test scores as the dependent variable and pre-test scores as covariates, a more powerful and less biased approach than comparing change scores in randomised trials (Van Breukelen, 2006; Vickers & Altman, 2001). Clustering of the intervention by seminar cohort was assessed using the intraclass correlation coefficient for each outcome across cohorts (both $< .01$), so individual-level models were used. One-way MANCOVA tested the combined post-test outcomes with both pre-test scores as covariates, with two Bonferroni-adjusted follow-up univariate tests ($\alpha = .025$). Assumptions were evaluated as recommended by Tabachnick and Fidell (2019): normality of residuals (Shapiro–Wilk), homogeneity of variance (Levene), homogeneity of regression slopes (group $\times$ covariate interaction), and, for MANCOVA, equality of covariance matrices (Box’s *M*) and multivariate outliers and multicollinearity. Effect sizes are reported as partial η^2 (.01, .06 and .14 for small, medium and large effects; Cohen, 1988; Lakens, 2013) with 95% confidence intervals for adjusted mean differences. Participants were analysed in their allocated groups (complete-case analysis). The analysis records needed to document an imputation-based sensitivity analysis (including the imputation method itself) were unavailable; the corresponding results are therefore not reported, and this is acknowledged as a limitation (see the Limitations section).

Results

Participant Flow, Adherence and Baseline Characteristics

Of 102 eligible students, 80 were randomised (40 per group) (Figure 1). Seventy-five participants (37 experimental, 38 control) were included in the analysis; five participants (6.3%) were lost to follow-up (three experimental, two control). Adherence to step aerobics and coping seminars averaged 91.2% (SD = 6.8) and 93.5%, respectively; 35 of the 37 experimental participants met the a priori adherence criterion of attendance at $\geq 80\%$ of scheduled sessions. One participant in the experimental group withdrew because of a musculoskeletal injury, as recorded in Figure 1; no other serious adverse events were reported. Four participants reported transient muscle soreness. The groups were equivalent at baseline on BMI, $t(73) = 0.94$, $p = .351$, and on perceived stress, $t(73) = -0.82$, $p = .416$ (Table 1).

Figure 1: Participant Flow Diagram (CONSORT)

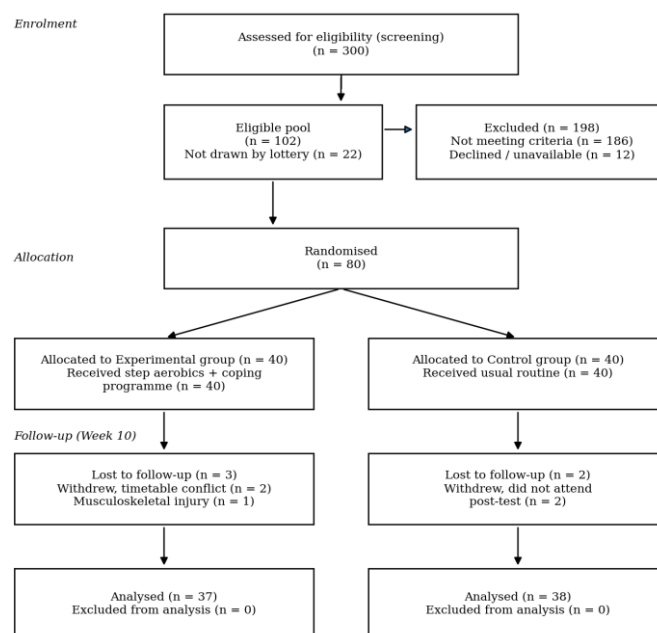


Table 1: Baseline Characteristics of Participants Included in the Analysis

Variable	Experimental (n = 37)	Control (n = 38)	t(73)	P
Age (years), M (SD)	20.9 (1.8)	21.1 (2.0)	-0.46	.647
Height (m), M (SD)	1.62 (0.06)	1.63 (0.06)	-0.70	.486
Body weight (kg), M (SD)	72.2 (5.4)	72.3 (5.9)	-0.08	.939
BMI (kg/m ²), M (SD)	27.51 (1.26)	27.22 (1.46)	0.94	.351
PSS-10 score, M (SD)	24.00 (2.19)	24.47 (2.79)	-0.82	.416
IPAQ-SF (MET-min/week), M (SD)	312 (148)	298 (139)	0.42	.676

Note: BMI = body mass index; PSS-10 = 10-item Perceived Stress Scale; IPAQ-SF = International Physical Activity Questionnaire, short form.

Source: Author's fieldwork data.

Effects on Body Mass Index and Perceived Stress

Descriptive statistics are shown in Table 2 and Figure 2. Within the experimental group, BMI fell from 27.51 to 26.53 kg/m² (-3.6%), $t(36) = -12.17$, $p < .001$, and PSS-10 scores fell from 24.00 to 18.78, $t(36) = -7.10$, $p < .001$. In the control group, BMI changed little (-0.16 kg/m²; $p = .078$) and perceived stress was unchanged ($p = .968$).

Table 2: Pre-test and Post-test BMI and PSS-10 scores by Group

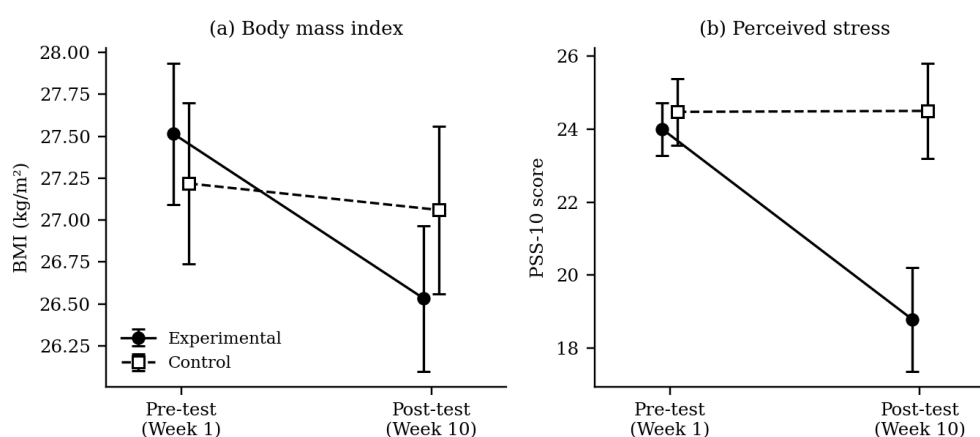
Outcome / group	n	Pre-test M (SD)	Post-test M (SD)	Change M (SD)	t	p	d_z
BMI (kg/m ²)							
Experimental	37	27.51 (1.26)	26.53 (1.31)	-0.98 (0.49)	-12.17	< .001	-2.01

Outcome / group	n	Pre-test M (SD)	Post-test M (SD)	Change M (SD)	t	p	d_z
Control	38	27.22 (1.46)	27.06 (1.52)	-0.16 (0.54)	-1.83	.078	-0.29
PSS-10 score							
Experimental	37	24.00 (2.19)	18.78 (4.28)	-5.22 (4.47)	-7.10	< .001	-1.17
Control	38	24.47 (2.79)	24.50 (3.94)	0.03 (4.01)	0.04	.968	0.01

Note: Paired-samples *t* tests within groups (*df* = 36 and 37); *d_z* = standardised mean change.

Source: Author's fieldwork data.

Figure 2: Pre-test and Post-test Means for BMI and Perceived Stress by Group



Note: Error bars show 95% confidence intervals. The vertical axes are truncated to display group differences clearly and do not start at zero. Source: Author's fieldwork data.

Assumption checks: The assumptions of ANCOVA were met. For BMI, the group $\times$ pre-test interaction was non-significant ($p = .888$), variances were homogeneous (Levene $p = .750$), and residuals were normally distributed (Shapiro–Wilk $p = .964$); the corresponding values for perceived stress were $p = .730$, $p = .599$ and $p = .315$. For the MANCOVA, Box's test of equality of covariance matrices and the homogeneity-of-regression-slopes test could not be independently verified because the original SPSS output was unavailable; this is acknowledged as a limitation, and the multivariate result is interpreted accordingly.

Hypothesis 1 (BMI): After controlling for pre-test BMI (pre–post $r = .89$), there was a significant effect of group on post-test BMI, $F(1, 72) = 46.09$, $p < .001$, partial $\eta^2 = .39$ (Table 3). The adjusted mean difference was -0.81 kg/m^2 , 95% CI $[-1.05, -0.58]$. H_{01} was therefore rejected.

Table 3: ANCOVA Results for Post-test BMI and PSS-10 scores Controlling for Pre-test Scores

Outcome	Experimental adjusted M (SE)	Control adjusted M (SE)	Adjusted difference [95% CI]	F(1, 72)	p	Partial η^2
BMI	26.39 (0.09)	27.20 (0.08)	-0.81 [-1.05, -0.58]	46.09	< .001	.39
PSS-10	18.88 (0.66)	24.40 (0.65)	-5.52 [-7.37, -3.67]	35.23	< .001	.33

Note: Adjusted means are evaluated at the grand mean of each covariate (pre-test BMI = 27.36; pre-test PSS-10 = 24.24). Source: Author's fieldwork data.

Hypothesis 2 (perceived stress): After controlling for pre-test scores (pre-post $r = .26$), the groups differed significantly on post-test PSS-10 scores, $F(1, 72) = 35.23$, $p < .001$, partial $\eta^2 = .33$. The adjusted mean difference was -5.52 points, 95% CI [-7.37, -3.67]. H_{02} was rejected.

Hypothesis 3 (joint effect): MANCOVA showed a significant multivariate effect of group on the combined post-test outcomes after controlling for both pre-test scores, Wilks' $\Lambda = .48$, $F(2, 71) = 38.25$, $p < .001$, multivariate partial $\eta^2 = .52$; H_{03} was rejected. The univariate results reported above remained significant at the Bonferroni-adjusted α of .025.

Clinically meaningful change: A reduction of at least 3% in BMI was achieved by 22 of 37 experimental participants (59.5%) and 3 of 38 controls (7.9%), $\chi^2(1, N = 75) = 22.43$, $p < .001$, $\phi = .55$. A post-test PSS-10 score below 20, the study's entry threshold, was reached by 21 experimental participants (56.8%) and 2 controls (5.3%), $\chi^2(1, N = 75) = 23.38$, $p < .001$, $\phi = .56$. A sensitivity analysis conducted alongside the main analysis gave the same conclusions; however, the imputation method and detailed results could not be documented from the available records and are therefore not reported here, and this is acknowledged as a limitation.

Discussion of Findings

This randomised trial examined whether an eight-week programme combining structured step aerobics with weekly psycho-social coping seminars improved BMI and perceived stress among overweight, sedentary female undergraduates at FUE Zaria. The experimental group showed significantly lower BMI and perceived stress than the control group after adjustment for baseline values, and the combined effect was large. All three null hypotheses were rejected.

Body Mass Index

The adjusted BMI difference of 0.81 kg/m² between groups approximately 3.0% of the mean baseline BMI is modest in absolute terms, while the within-group reduction in the experimental group was 3.6% (0.98 kg/m², or roughly 2.6 kg of body weight). The direction of the effect is consistent with evidence that about 90 minutes of weekly structured activity produces modest weight change and that larger reductions require higher weekly volumes

(Donnelly et al., 2009). It also agrees with findings that step aerobics improves body composition in young women (Spirtović et al., 2024) and that aerobic dance reduces body fat in Nigerian Colleges of Education students (Ajayi & Moses, 2024), although a comparable ten-week trial found no body-composition change when diet was uncontrolled (Drobnik-Kozakiewicz et al., 2013). The result supports the biological arm of the biopsychosocial model: regular, supervised, moderate-intensity exercise raises energy expenditure in a previously inactive population. The magnitude of the weight change is nevertheless larger than the exercise dose alone would predict. Because participants knew their allocation and were motivated volunteers, dietary intake was not monitored and may have changed in response to the programme (expectancy or Hawthorne effects), and BMI does not distinguish fat from lean mass, the effect size should be interpreted cautiously. These possibilities qualify but, given randomisation and blinded measurement of weight, do not undermine the group difference. Measurement of body fat percentage and waist circumference is recommended in future work.

Perceived Stress

Perceived stress decreased by about five points in the experimental group and did not change in the control group, a difference of 5.52 points after adjustment. This type of reduction follows the evidence of a meta-analysis of physical activity reducing stress among undergraduates (Huang et al., 2024; Liu et al., 2025) and of skills-based stress-reduction interventions being beneficial (Regehr et al., 2013). Repeated, well-recovered stressor factors of physical exercise and coping skill acquisition might have minimized physiological and perceived stressor factors (Sothmann et al., 1996; Selye, 1950; Gerber & Pühse, 2009). The seminars could have affected the meaning participants gave to their demands (Lazarus & Folkman, 1984), increased their coping repertoire, and made them social support within the group. The adjusted stress difference is slightly more than 2 times the above meta-analysis-derived SMD of -0.61 , and should therefore be interpreted with caution. The effect could have been inflated due to expectancy and social-desirability effects because the outcome was self-reported by the unblinded participants compared to a passive no-treatment control group, but an attention-control condition and blinded or physiological stress measures would bolster the causal argument. The two outcomes can be linked too: stress is a likely factor in weight gain (Adam & Epel, 2007; Tomiyama, 2019), and by reducing stress, weight management over a more extended time period could be aided.

Joint Effect and Practical Significance

The multivariate finding, along with the higher percentage of experimental students who experienced a 3% reduction in BMI (59.5% of the experimental group, compared to 7.9% of the control group) or a PSS-10 score below the entry score (56.8% of the experimental group, compared to 5.3% of the control group), suggest a practical impact on an individual student level as well as statistical. The programme was implemented using the current campus facilities and standard adjustable steps, indicating that it was likely to be feasible

for university wellness services, but no cost analysis was conducted and costs are not claimed. This high adherence can be explained by the format of the activity, which was designed for women and held inside, and where women face barriers in conservative environments (Zhou & Liu, 2025); this explanation was not tested directly as no other format was compared, but it is plausible.

Limitations and Future Directions

The results are subject to a number of caveats. It was tested in one location using a volunteer group of female undergraduates, thus reducing the generalisability of the results to male students, other institutions and non-volunteers. There was no observation of dietary intake or physical activity outside of the sessions and weight changes within the study are not necessarily solely due to the dose of exercise. Outcomes were measured over eight weeks with no follow-up, so the durability of the effects is unknown. BMI, rather than body fat percentage or waist circumference, was the weight outcome, and perceived stress was self-reported by unblinded participants against a passive control, leaving expectancy effects a plausible alternative explanation for part of the stress effect. The exercise and coping components were delivered together and cannot be separated, and the trial was not registered. The study was also conducted without prior approval from an institutional ethics committee, with consent-based safeguards as described in the Method. Finally, the analysis records were incomplete: the imputation method and outputs for the sensitivity analysis, and the diagnostic tests for the multivariate analysis (Box's M and homogeneity of regression slopes), could not be retrieved from the available records and could not be independently verified. These limitations directly motivate the future research directions below.

Conclusion

Within this single institution and eight-week period, a programme combining structured step aerobics with psycho-social coping sessions was associated with significantly greater reductions in BMI and perceived stress among overweight, sedentary female undergraduates at FUE Zaria than a usual-routine control, with a large combined multivariate effect.

Implications for Practice

Within settings similar to FUE Zaria, northern Nigerian universities serving female students whose participation is constrained by sociocultural norms, the findings support the introduction of supervised, indoor, women-only step aerobics combined with weekly coping-skills sessions as a structured wellness service, delivered collaboratively by physical and health education staff and counselling personnel, as was done in this trial.

Programme planners should consider extending session duration or weekly frequency towards at least 150 minutes of moderate activity, in view of the modest weight change associated with the present dose, and should complement the programme with basic dietary guidance, since diet was not controlled.

Directions for Future Research

Future trials should use a factorial or three-arm design (exercise only, coping only, combined) with an attention-control condition to isolate the components and exclude expectancy effects; add body-composition and physiological stress markers (for example, waist circumference, body fat percentage, cortisol) alongside self-reported stress; monitor dietary intake; recruit across multiple sites; register the trial; obtain prior ethics-committee approval; and follow participants for at least six months to establish durability.

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