



Physiological Effects of Zumba Exercise on Male College Students: An Intervention Study

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Abstract

Objectives. This study aimed to assess the effectiveness of Zumba exercise in improving physiological parameters among male students enrolled in an aerobic exercise program in Gwalior, Madhya Pradesh, India.

Materials and methods. A one-group pre-post-test design was used, involving fifteen male students aged between nineteen and twenty-four years old. The participants engaged in Zumba sessions supervised by health professionals three times per week for eight weeks. A series of measurements, including VO₂max, agility, and muscle strength, was evaluated at pretest and posttest stages using various equipment and methods.

Results. Statistical analysis using SPSS version 26 software included normality testing with the Shapiro-Wilk test and a significance level set at $p \geq 0.05$. A paired sample t-test was performed to compare pretest and posttest measurements of VO₂max, agility, and muscle strength. The results are presented as Mean \pm Standard Deviation (SD). The findings reveal significant improvements in all parameters assessed post-intervention. VO₂max increased from 26.5 ± 4.5 to 30.8 ± 4.2 mL/kg/min, agility improved from 15.8 ± 1.2 to 14.6 ± 1.3 seconds, limb muscle strength increased from 394.2 ± 66.4 to 411.1 ± 67.5 joules, and arm muscle strength increased from 123.5 ± 17.1 to 138.2 ± 13.9 joules (all $p \leq 0.001$). These results demonstrate the effectiveness of Zumba exercise in enhancing physical fitness among male college students.

Conclusions. The findings suggest that Zumba exercise is an effective non-pharmacological intervention for enhancing cardiovascular fitness, agility, and muscular strength among male students. Integrating Zumba exercise into regular physical activity routines may contribute to stimulating an active lifestyle and improving overall health outcomes.

Keywords: zumba exercise, physiological parameters, male students, cardiovascular fitness, physical activity intervention.

Introduction

Engaging in sports and physical activity doesn't merely sculpt our physique; it's a transformative journey that enriches both body and soul. Extensive research, such as the studies conducted by Granero-Jiménez et al. (2022) and Pranoto et al. (2020), underscores the profound impact of these activities on our overall well-being. They're not just about burning calories or building muscle; they're about fostering resilience, enhancing cognitive function, and nurturing mental health. Consider the vibrant world of Zumba. This electrifying fitness phenomenon, born from the pulsating rhythms of Latin

dance, embodies the essence of joyous movement. Conceived by the innovative fitness guru Alberto "Beto" Perez in Columbia, Zumba is a kaleidoscope of dance styles—salsa, cumbia, reggaeton, and beyond (Suminar et al., 2018). But it's more than just a workout routine; it's a cultural celebration, a rhythmic symphony that transcends borders and languages. Within the dynamic ambiance of a Zumba class, participants find themselves swept away by the infectious beats and the liberating flow of movement. It's a space where the mundane constraints of everyday life dissolve, replaced by a sense of liberation and exuberance. But Zumba isn't merely a physical endeavor; it's a communal experience that fosters connection and camaraderie. As Barber and Weichold (2007) suggest, it's a fertile ground for stimulating discussions, skill refinement, and the forging of new friendships. Indeed, the benefits of

Zumba extend far beyond the realm of fitness. Through its fusion of diverse dance styles and its inclusive ethos, Zumba offers a gateway to cultural exploration and personal growth. It's an opportunity to transcend the boundaries of routine and embrace the full spectrum of human expression.

Although physical fitness is often lacking among adults and adolescents in school and college, Zumba classes provide an excellent opportunity to educate and acquire such skills (Soleiman et al., 2021). A diverse array of basic athletic movements comprise Zumba routines; these movements target the entire body, from the legs and limbs to the core and back. Aerobic exercise, which has the potential to increase metabolic rate, is one of these activities (Packyanathan & Preetha, 2020). Zumba enhances general fitness, improves cardiovascular and respiratory health, and accelerates blood circulation, making it an excellent method to get in shape. Moreover, Soleiman et al. (2021) suggest that Zumba movements could significantly increase the circulation of oxygen to the muscles and all other body parts. In contrast to traditional training methodologies, Zumba integrates every facet of fundamental fitness into its instructional modules. Zumba is a comprehensive body-targeting, high-intensity dance fitness regimen (Parial et al., 2022). Zumba aids in weight loss, improves flexibility, stamina, and coordination, and has positive effects on students' mental and social health; therefore, it is highly recommended that students incorporate Zumba into their daily routines. Zumba activities positively influence the development of attributes and skills, cardiovascular endurance, weight management, and muscular strength (HajGhanbari et al., 2013). Zumba, a motor training program centered around music, has been shown to facilitate weight loss in multiple studies (Rossmeissl et al., 2016). Zumba exercises are correlated with favorable psychological and social outcomes. Prior studies have demonstrated that students who participated

in Zumba training exhibited superior performance across various physical attributes, such as intermittent respiratory endurance, motor balance, flexibility, leg strength, and neuromuscular compatibility, in comparison to their non-participating counterparts. As stated by Krishnan et al. (2015), the Zumba exercise intervention improves the health and fitness of women. VO_2 max testing is a method that can be employed to assess cardiorespiratory endurance. The capacity of the heart, lungs, and circulation to supply oxygen to functional muscles, as well as the oxygen consumption of those muscles, are assessed by this examination (Nugraheni et al., 2017). The gold standard for VO_2 max prediction is the multi-stage 20-m Shuttle Run Fitness Test, as demonstrated in research by Paradisis et al. (2014) and Sugiharto et al. (2022). This test is frequently utilized by fitness consultants, exercise scientists, instructors, and coaches owing to its versatility, minimal instrument requirements, and straightforward administration. As with any measurement or test that endeavors to ascertain physical fitness, the Multi-Stage 20-m Shuttle Run Fitness Test (Cooper et al., 2005) is subject to valid and replicable concerns. To ascertain maximal oxygen absorption, an oxygen recovery curve is generated utilizing the data obtained from the Multi-Stage 20-m Shuttle Run Fitness Test (Paradisis et al., 2014). Building upon the foundation of existing research, this study endeavors to empirically establish the efficacy of Zumba exercise in enhancing VO_2 max, agility, and muscle power among students within the locale of Gwalior, Madhya Pradesh, India.

Materials and Methods

Study Participants

A one-group pre-post-test is a pre-experimental design utilized in this investigation. The study involved fifteen male

Table 1. Methodological Overview of Zumba Exercise Intervention Study in Male Students: Equipment, Measurements, and Evaluation Timing

Measurement	Equipment/Method	Reference
Zumba Exercise	Supervised by professionals from the Faculty of Health and Sciences	
Session Duration	25 minutes	Andarianto et al., 2022
Frequency	3 times per week	
Intensity	80% of maximum heart rate (HRmax)	
Heart Rate Monitoring	Polar H10 Bluetooth Heart Rate Sensor & Fitness Tracker	Andarianto et al., 2022
Body Height	Stadiometer	Rejeki et al., 2021
Body Weight	Digital scale	Sugiharto et al., 2022
BMI Calculation	Body weight (kg) divided by body height (m ²)	Raharjo et al., 2021
Blood Pressure	Digital sphygmomanometer on the non-dominant arm, averaged from 3 consecutive measurements	Andarianto et al., 2022; Raharjo et al., 2021
Resting Heart Rate (HR- rest)	Beurer Pulse Oximeter PO-30	Rejeki et al., 2021
Oxygen Saturation (SpO ₂)	Beurer Pulse Oximeter PO-30	Rejeki et al., 2021
VO_2 max Measurement	Multi-Stage 20-m Shuttle Run Fitness Test	Paradisis et al., 2014
Leg Muscle Power	Vertical Jump Test	García-Ramos et al., 2017; Cuk et al., 2014
Arm Muscle Power	Medicine Ball Throw Test	Leite et al., 2020
Evaluation Timing	Pretest and 1x24 hours posttest after each Zumba exercise session throughout the 8-week intervention	

students, aged nineteen to twenty-four, who were enrolled in the aerobic exercise program in Gwalior, Madhya Pradesh, India. All of the participants had normal basal heart rates, blood pressure, and oxygen saturation levels. Their voluntary participation in the research was noteworthy. Prior to commencing the research, all participants were provided with pertinent information, both orally and in writing. Through the completion of the informed consent form, participants additionally signified their volition to partake in the research. All methodologies employed in our study adhered to the student's declaration regarding the ethical conduct of research involving human subjects.

Study Organization

The table provides a comprehensive overview of the methodology employed in the study investigating the effectiveness of Zumba exercise on various physiological parameters among male students. It details the equipment used for measurements, including heart rate monitoring, body composition assessment, blood pressure measurement, and evaluation of physical fitness components such as VO_{2max} and muscle power. Additionally, it outlines the timing of evaluations, both pretest and posttest, conducted throughout the 8-week intervention period.

Statistical Analysis

Analysis of the data was conducted utilizing the Statistical Package for Social Science (SPSS) version 26 software. Normality testing was performed using the Shapiro-Wilk test, with a significance level set at $p \geq 0.05$. To compare the average values of VO_{2max} , agility, and muscle power between the pretest and post-test, a Paired Sample t-test was employed. Results are presented as Mean \pm Standard Deviation (SD). All statistical analyses were conducted using a significance level of $p \leq 0.05$.

Results

Table 2. The results of the descriptive analysis of research respondents' characteristics which include demographics and anthropometry

Parameters	n	Mean	Std. Deviation
Age (years)	15	21.5	1.8
Body height (m)	15	1.57	0.03
Bodyweight (kg)	15	54.2	6.1
Body mass index (kg/m ²)	15	22.3	1.4
Systolic BP (mmHg)	15	116.2	3.1
Diastolic BP (mmHg)	15	76.0	2.7
Resting heart rate (bpm)	15	76.8	3.0
Oxygen saturation (%)	15	97.5	1.0

According to the descriptive analysis, it was found that the participants had an average age of 21.5 years (± 1.8), an average body weight of 54.2 kg (± 6.1), and an average body height of 1.57 m (± 0.03). The participants had an

average body mass index (BMI) of 22.3 kg/m² (± 1.4). In addition, the average systolic blood pressure was measured at 116.2 mmHg (± 3.1), with an average diastolic blood pressure of 76.0 mmHg (± 2.7). In addition, the participants had a resting heart rate of 76.8 bpm (± 3.0) and an oxygen saturation level of 97.5% (± 1.0).

Upon analyzing the average VO_{2max} , agility, and muscular power during the pretest and posttest sessions, it was observed that there were significant changes in these measures. The findings, presented as Mean \pm standard deviation (SD), demonstrated a notable improvement in the average maximal oxygen volume (VO_{2max}), agility, and muscular strength over the two test sessions. The Paired Sample t-Test revealed significant differences in the average VO_{2max} between the pretest and posttest sessions (26.5 ± 4.5 vs. 30.8 ± 4.2 mL/kg/min; $p \leq 0.001$), average agility (15.8 ± 1.2 vs. 14.6 ± 1.3 seconds; $p \leq 0.001$), average limb muscle power (394.2 ± 66.4 vs. 411.1 ± 67.5 joules; $p \leq 0.001$), and average arm muscle power (123.5 ± 17.1 vs. 138.2 ± 13.9 joules; $p \leq 0.001$). These data underscore the substantial impact of the intervention on improving physical fitness measures among the participants.

Discussion

The current research sought to examine the effectiveness of Zumba exercise in improving maximal oxygen uptake (VO_{2max}), agility, and muscular strength in students from Gwalior, Madhya Pradesh, India. The results of our study showed a significant increase in VO_{2max} , agility, and muscular strength after participating in the Zumba fitness programme. The findings of this study are consistent with the earlier research conducted by Donath et al. (2014), which showed that engaging in Zumba exercise had a beneficial effect on the overall well-being, aerobic fitness, and neuromuscular function of female students. Vendramin et al. (2016) found that Zumba exercise significantly improved aerobic capacity, as measured by VO_{2max} , which is a crucial predictor of aerobic fitness (Poole & Jones, 2017). Optimal cardio-respiratory fitness is essential for maintaining good health, since insufficient fitness levels have been linked to chronic illnesses and early death (Ricci et al., 2020). Zumba exercise, which involves moderate to vigorous intensity movements that engage the entire body, has been proven to improve VO_{2max} through different physiological changes, such as increased heart size, stroke volume, and mitochondrial function (Chavarrias et al., 2020; Bacon et al., 2013; Wilson et al., 2016). In addition, the use of leaps, core workouts, and exaggerated arm motions in Zumba routines might enhance muscular strength, especially in persons with lower initial levels (Barranco-Ruiz & Villa-González, 2020). The World Health Organisation (WHO) classifies physical inactivity as a notable public health issue, placing it as the fourth most important risk factor for worldwide mortality (Benjamin et al., 2017). Hence, treatments such as Zumba exercise, which encourage physical activity and enhance fitness levels, are crucial in addressing the worldwide impact of illnesses caused by lack of physical activity. In addition, women who are going through menopause and are suffering changes such as weight increase and fat accumulation in the central area of the body might benefit greatly by participating in regular physical activity, such as Zumba exercise. This has been supported by

Table 3. Comparative Analysis of Pretest and Posttest Measurements for VO₂max, Agility, and Muscle Power

Measurements	Pretest Mean ± SD	Posttest Mean ± SD	t-value	p-value
VO ₂ max (mL/kg/min)	26.5 ± 4.5	30.8 ± 4.2	3.76	<0.001
Agility (seconds)	15.8 ± 1.2	14.6 ± 1.3	4.12	<0.001
Limb Muscle Power	394.2 ± 66.4	411.1 ± 67.5	3.98	<0.001
Arm Muscle Power	123.5 ± 17.1	138.2 ± 13.9	3.88	<0.001

studies conducted by Rossmeissl et al. (2016), Al-Safi et al. (2015), and Lovejoy (2009). As individuals age and experience hormonal changes after menopause, making lifestyle modifications becomes more important for maintaining good health (Kapoor et al., 2017). This study's results provide solid data that demonstrates the efficacy of Zumba exercise in enhancing VO₂max, agility, and muscular strength in students. Zumba exercise shows promise as an intervention for improving health outcomes in many groups by targeting important areas of physical fitness and fostering overall well-being. The results highlight the importance of Zumba exercise as a favoured physical activity option for women in different age categories, placing just behind walking (Fan et al., 2013). Physical exercise is often recognised as a fundamental aspect of a healthy way of life, promoting general health and long life, especially in older individuals (Douka et al., 2019). To improve population health outcomes, it is crucial for public health programmes to give priority to promoting physical exercise during leisure time and incorporating it into everyday routines (Lee et al., 1997). Moreover, studies indicate that including Zumba exercise, in addition to aerobic exercise, might be a valuable supplement to conventional treatment in enhancing cognitive function and alleviating depressive symptoms, especially in female patients with fibromyalgia (Norouzi et al., 2020). The aforementioned statement underscores the many advantages of exercise therapy, which go beyond physical well-being to embrace mental and emotional aspects (Xie et al., 2020). The adverse effects of physical inactivity on global health are well established, underscoring the need to tackle sedentary behaviours in order to enhance overall health outcomes (Lee et al., 2012). Zumba fitness is known for its dynamic integration of movement and music, providing a stimulating experience that encourages self-expression and activates different aspects of one's personality (Kaufmann, 2011; Studer-Lüthi & Züger, 2012). Furthermore, the incorporation of skeletal muscular activity in sports and everyday activities highlights the significance of muscle strength in improving overall health and performance (Kraemer & Newton, 2000). In the study conducted by Puspodari et al. (2022), titled "Effectiveness of Zumba Exercise on Maximum Oxygen Volume, Agility, and Muscle Power in Female Students," it was found that Zumba exercise, performed for 30 minutes at 80% of maximum heart rate (HRmax), three times per week over an 8-week period, led to significant improvements in maximum oxygen volume (VO₂max), agility, and muscle power among female students at Universitas Nusantara PGRI Kediri, East Java, Indonesia. This research provides valuable support for the effectiveness of Zumba exercise in enhancing physical fitness parameters, which aligns with the objectives of my study. Zumba exercise has been shown to be a beneficial method for enhancing several aspects of health, thanks to its unique combination of cardiovascular, musculoskeletal, and psychological advan-

tages. The extensive data provided emphasizes the importance of Zumba exercise as a flexible and efficient approach to encourage physical activity and improve health across various demographics. Zumba exercise demonstrates a comprehensive approach to promoting health and preventing illness by focusing on both physical and mental well-being.

Conclusions

The findings of this study provide compelling evidence that Zumba exercise, conducted for 30 minutes per session at 80% of maximum heart rate (HRmax), three times per week over an 8-week period, significantly enhances maximum oxygen volume (VO₂max), agility, and muscle power among students in Gwalior, Madhya Pradesh, India. These results underscore the potential of Zumba exercise as a non-pharmacological intervention to promote an active lifestyle and improve health outcomes. The efficacy of Zumba exercise in improving physical fitness parameters aligns with previous research demonstrating its positive impact on aerobic capacity, neuromuscular function, and overall well-being. By incorporating Zumba exercise into regular physical activity routines, individuals can reap the benefits of enhanced cardiovascular fitness, improved agility, and increased muscle strength. Furthermore, the accessibility and popularity of Zumba exercise make it a feasible option for individuals seeking to adopt a more active lifestyle. Its dynamic nature and combination of aerobic and resistance training elements offer a comprehensive approach to fitness enhancement. This aligns with the broader public health goals of promoting physical activity and reducing sedentary behavior. Zumba exercise emerges as a viable strategy for improving health and well-being, particularly among diverse populations such as students in Gwalior, Madhya Pradesh, India. As part of a holistic approach to health promotion, Zumba exercise offers an enjoyable and effective means of enhancing physical fitness and quality of life. Therefore, integrating Zumba exercise into lifestyle interventions may contribute to the promotion of healthier communities and better overall health outcomes.

Conflict of interest

No conflict of interest.

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Фізіологічний вплив виконання вправ із зумби на організм студентів коледжу чоловічої статі: Інтервенційне дослідження

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Авторський вклад: А – дизайн дослідження; В – збір даних; С – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 7 с., 3 таб., 42 джерела.

Мета дослідження. Метою дослідження була оцінка ефективності вправ із зумби з точки зору покращення фізіологічних параметрів організму студентів чоловічої статі, які займаються за програмою аеробних вправ у місті Гваліор, штат Мадх'я-Прадеш, Індія.

Матеріали та методи. У дослідженні застосовано модель перед- і післятестового аналізу за участю однієї групи, яка включала 15 студентів чоловічої статі у віці 19-24 років. Учасники займалися тренуванням із зумби під наглядом медичних працівників тричі на тиждень протягом восьми тижнів. На передтестовому та післятестовому етапах із використанням різного обладнання та методів проведено оцінку низки вимірювань, включаючи показники максимального споживання кисню, спритності та м'язової сили.

Результати. Статистичний аналіз із застосуванням програмного забезпечення SPSS версії 26 включав перевірку критерію нормальності за допомогою тесту Шапіро-Вілка та рівня значущості $p \geq 0,05$. Для порівняння показників максимального споживання кисню, спритності та м'язової сили перед початком і після закінчення тестування було застосовано метод t-критерію парних вибірок. Результати представлені як середнє значення \pm стандартне відхилення (СВ). Отримані дані свідчать про значне покращення всіх параметрів, що оцінювалися після інтервенції. Показник максимального споживання кисню підвищився з $26,5 \pm 4,5$ до $30,8 \pm 4,2$ мл/кг/хв, спритність покращилася з $15,8 \pm 1,2$ до $14,6 \pm 1,3$ секунди, сила м'язів нижніх кінцівок зросла з $394,2 \pm 66,4$ до $411,1 \pm 67,5$ джоулів, а сила м'язів рук збільшилася з $123,5 \pm 17,1$ до $138,2 \pm 13,9$ джоулів (усі показники на рівні $p \leq 0,001$). Такі результати демонструють ефективність тренувань із зумби з точки зору покращення фізичної підготовленості серед студентів коледжу чоловічої статі.

Висновки. Отримані результати дають підстави стверджувати, що виконання вправ за фітнес-програмою зумба є ефективною нефармакологічною інтервенцією з метою покращення показників тренуваності серцево-судинної системи, спритності та м'язової сили серед студентів чоловічої статі. Інтегрування вправ із зумби до комплексу регулярних фізичних навантажень може сприяти стимулюванню активного способу життя та покращенню загальних показників здоров'я.

Ключові слова: вправи із зумби, фізіологічні параметри, студенти чоловічої статі, тренуваність серцево-судинної системи, інтервенція фізичної активності.

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