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[Teoriâ ta Metodika Fizičnogo Vihovannâ]

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ORIGINAL SCIENTIFIC ARTICLE

THE EFFECT OF LOW-IMPACT AEROBIC DANCE EXERCISE VIDEO ON CARDIOVASCULAR ENDURANCE, FLEXIBILITY, AND CONCENTRATION IN FEMALES WITH SEDENTARY LIFESTYLE

Poppy Elisano Arfanda[1ABCD], Oce Wiriawan[1ABCD], Hari Setijono[1ABCD], Nining Widyah Kusnanik[1ABCD], Heryanto Nur Muhammad[1ABCD], Puspodari[1ABCD], Novadri Ayubi[1ABCD], Ians Aprilo[2ABCD] and Arimbi[2ABCD]

[1]State University of Surabaya
[2]Makassar State University

Authors' Contribution: A – Study design; B – Data collection; C – Statistical analysis; D – Manuscript Preparation; E – Funds Collection

Corresponding Author: Poppy Elisano Arfanda, E-mail: poppy.20014@mhs.unesa.ac.id
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Abstract

The study purpose was to prove the effectiveness of a low-impact aerobic dance exercise video on cardiovascular endurance, flexibility, and concentration in women with a sedentary lifestyle.

Materials and methods. This study used the Pre-Experimental method with a One-Group Pretest-Posttest Design research design. Total of 18 females aged 18-20 y.o., body mass index (BMI) 19 kg/m^2 – 24 kg/m^2, normal systolic and diastolic blood pressure, normal resting heart rate, oxygen saturation (SpO_2) 96% – 100% participated in the research. Low-impact aerobic dance exercise was done using video for 30 minutes/exercise session with an intensity of 75% – 85% HRmax with a frequency of 3 times/week for 6 weeks. Measurement of cardiovascular endurance was done using the Multi-Stage 20-m Shuttle Run Fitness Test, flexibility was measured with the Sit and Reach Test, and concentration was meassured with the Grid Concentration Test. The statistical analysis technique used the Paired Sample T-Test with a significance level of 5%.

Results. The results showed the average cardiovascular endurance of the pretest vs. posttest (28.13 ± 4.80 vs. 30.52 ± 0.88 mL/kg/min ($p \leq 0.001$)), mean flexibility of pretest vs. posttest (17.79 ± 4.72 vs. 18.75 ± 5.02 cm ($p < 0.001$)), mean concentration of pretest vs. posttest (7.39 + 2.38 vs. 9.11 + 2.45 score ($p < 0.001$)).

Conclusions. Based on the results of the study, it was concluded that a low-impact aerobic exercise dance video performed with a frequency of 3 times/week for 6 weeks increased cardiovascular endurance, flexibility, and concentration in adolescent girls with a sedentary lifestyle.

Keywords: aerobic dance exercise, cardiovascular endurance, flexibility, concentration, sedentary lifestyle.

Introduction

Indonesia faces a serious problem, namely the lack of participation of the Indonesian people in physical activity (Rachmi et al., 2017). This issue refers to people of various ages, including adolescents (17-25 years), early adults (26-35 years) and late adults (36-45 years) who experience difficulty in carrying out physical activities due to their busy working hours. Furthermore, the Ministry of Health of the Republic of Indonesia stated that obesity and stress are one of the symptoms and impacts of the limited participation of Indonesian people in physical activity (Ramania et al., 2020). Likewise, the increasing development of technology that significantly reduces the volume and intensity of physical activity can lead to health problems, such as the increased risk of cardiovascular diseases (CVD), type 2 diabetes mellitus (T2DM), obesity (Kovacova et al., 2011; Chuprun & Yurchenko, 2020; Rejeki et al., 2021; Rejeki et al., 2022).

Currently, aerobic dance is very popular in various parts of the world (Schroeder et al., 2017). Aerobic dance is one type of gymnastics that is developing, it is favored by the community for several reasons, such as being able to practice anywhere, alone or together, and at low cost. Several previous studies reveal the benefits of doing aerobic dance can reduce the level of the individual stress response, and reduce

psychosomatically (Ramania et al., 2020). The popularity of aerobic dance is associated with the type of physical activity that is following the concept of gender identity, the concept of femininity, and female body image (Chuprun & Yurchenko, 2020).

Aerobic dance is a form of endurance training, including the most preferred physical activity, especially for women. In line with the results of this study, it shows that the female population prefers aesthetically oriented physical activities, such as aerobic dance (Kovacova et al., 2011). Movement in aerobic dance is always accompanied by music, this is intended to make this aerobic dance interesting (Stamford, 2016). In carrying out the aerobics dance, participants really enjoyed the process that took place, this was helped by the support of music (Hua & Ye, 2020). In socializing dance aerobics, movements and music must always be updated, because this will greatly impact the popularity of aerobics itself (Dun et al., 2021). Therefore, music that is fun, full of energy, and has moving colors is chosen. The music selected usually has four beats per beat with a steady beat (Arfanda, 2015). It is hoped that with interesting music there will be harmony between movement and rhythm, it is intended that this aerobics dance is interesting for various variations and creativity.

Aerobic dance is one of the most common forms of aerobic exercise (Zarębska et al., 2016). Aerobic exercise is an activity that requires a lot of oxygen and will ultimately improve the oxygen transport system in the body. This system is often referred to as the cardiovascular system because the heart and blood vessels are the means of transporting oxygen (Arfanda, 2019). In general, aerobics dance is a sport that can improve heart and respiratory function.

Someone who does not do a lot of physical activity will have a higher risk of cardiovascular disease than those who are active (Mehta et al., 2020). Cardiorespiratory endurance is the ability of the heart, lungs, and blood vessels to function optimally at work to take oxygen optimally and distribute it throughout the body, especially to active tissue so that it can be used for the body's metabolic processes (Arimbi et al., 2019). Success in endurance sports requires a good level of aerobic or cardiorespiratory and endurance exercise depends on aerobic metabolism (Arimbi et al., 2017).

Flexibility is an important contributor to sports performance, the fact is that high levels of flexibility can reduce the risk of injury. Flexibility is a parameter that can affect the risk of injury (Setyawan et al., 2021). Flexibility refers to the intrinsic property of body tissues that determines range of motion (ROM) without causing injury (Nuzzo, 2020). This study deals with static flexibility by performing sit and reach tests. Sit-and-reach requires participants to sit on the floor or a chair and reach toward their toes.

The more specific concentration of mind in training and sports competitions can affect attention and concentration during the athlete's activity. Athletes who can train their concentration, then they will be able to control the negative things that affect training and competition (Manikam, 2021). Therefore, this study aims to prove the effectiveness of low-impact aerobic dance exercise videos on increasing cardiovascular endurance, flexibility, and concentration in women with a sedentary lifestyle. We hypothesized that the provision of low-impact aerobic dance exercise videos was effective in improving cardiovascular endurance, flexibility, and concentration in women with a sedentary lifestyle.

Material and Methods

Study participants

This research is Pre-Experimental with One-Group Pretest-Posttest Design. A total of 18 female adolescents aged 18-20 y.o., body mass index (BMI) 19-24 kg/m^2, normal systolic and diastolic blood pressure, normal resting heart rate, oxygen saturation (SpO_2) 96-100% participate in research.

Study organization

Before participating in the study, all respondents received information orally and in writing about this research. All respondents stated that they were willing to sign the informed consent. All procedures performed in our study complied with the Declaration of the World Medical Association of Helsinki on the ethical conduct of research involving human subjects. The low impact aerobic dance exercise video program was implemented and supervised by professional officers from the Faculty of Sports Science, Makassar State University. Low impact aerobic dance exercise videos are performed using videos for 30 minutes/exercise session with an intensity of 75% – 85% HRmax with a frequency of 3x/week for 6 weeks. Heart rate monitoring during a low-impact aerobic exercise dance video using a polar heart rate monitor (Polar H7 Bluetooth Heart Rate Sensor & Fitness Tracker, Inc., USA).

Data were collected for measurement of body height (BH) using a Stadiometer (Portable Seca® Stadiometer, North America). Body weight (BW) was measured using a digital scale (OMRON Model HN-289, Omron Co., Osaka, Japan). BMI is calculated by dividing the BW (kg) divided by the BH (m^2). Measurement of blood pressure using an OMRON digital sphygmomanometer (OMRON Model deluxe HEM-7130-L, Osaka, Japan) on the non-dominant arm 3 times in a row with a 2-minute rest interval between the two measurements then the average value of the three measurements was taken (Andarianto et al., 2022). The Beurer Pulse Oximeter PO-30 (PO 30 Pulse Oximeter) is used to measure resting heart rate and SpO_2. Cardiovascular endurance measurement using the Multi-Stage 20-m Shuttle Run Fitness Test (Paradisis et al., 2014), flexibility with Sit and Reach Test (ACSM, 2000; Baltaci et al., 2003) and concentration with Grid Concentration Test (Tache et al., 2017). Measurements of cardiovascular endurance, flexibility, and concentration were carried out before and 2×24 hours after 6 weeks of low-impact aerobic exercise dance video intervention.

Statistical analysis

The statistical analysis technique used the Statistic Package for Social Science (SPSS) version 21 software. The normality test used the Shapiro-Wilk test, while to determine the difference between cardiovascular endurance, flexibility, and concentration before and after the intervention, the Paired Sample T-Test with significant level ($p \leq 0.05$). All data displayed Mean ± Standard Deviation (SD).

Results

The results of the descriptive analysis of the respondent's characteristic data between the pretest vs. posttest include age, height, weight, body mass index, systolic blood pres-

sure, diastolic blood pressure, resting heart rate, oxygen saturation is presented in Table 1.

Table 1. Data on the characteristics of respondents between pretest vs. posttest

Parameters	n	Low Impact Aerobic Exercise Dance Video		p-value
		Pretest	Posttest	
Age (yrs)	18	19.22±0.81	19.22±0.81	1.000
Body height (m)	18	1.62±0.04	1.62±0.04	1.000
Body weight (kg)	18	56.72±3.29	55.00±2.98*	0.000
Body mass index (kg/m²)	18	21.76±1.33	21.10±1.24*	0.000
Systolic blood pressure (mmHg)	18	118.61±2.81	112.11±2.52*	0.000
Diastolic blood pressure (mmHg)	18	79.11±3.94	74.78±3.69*	0.000
Resting heart rate (bpm)	18	78.06±3.79	75.50±3.33*	0.000
Oxygen saturation (%)	18	96.83±0.86	98.17±0.10*	0.000

Description: (*)Significant vs. Pretest ($p \leq 0.001$). p-value was obtained by using the Paired Sample T-Test. Data are presented with Mean ± Standard Deviation (SD).

Based on Table 1, it can be seen that there are changes in the average body weight, body mass index, systolic blood pressure, diastolic blood pressure, resting heart rate, oxygen saturation between pretest vs. post-test, while the mean age and body height did not show any change between pretest vs. posttest. The results of the Paired Sample T-Test showed that there was a significant difference in average body weight, body mass index, systolic blood pressure, diastolic blood pressure, resting heart rate, oxygen saturation between pretest vs. posttest ($p \leq 0.001$), while the mean age and body height did not show any significant difference between pretest vs. posttest ($p \geq 0.05$). The results of the analysis of the average cardiovascular endurance, flexibility, and concentration between the pretest vs. posttest can be seen in Figure 1.

Based on Table 1, it can be seen that there is an increase in the average cardiovascular endurance, flexibility, and concentration between the pretest vs. posttest. The results of the Paired Sample T-Test showed a significant difference in the average increase in cardiovascular endurance, flexibility, and concentration between the pretest vs. posttest ($p \leq 0.001$).

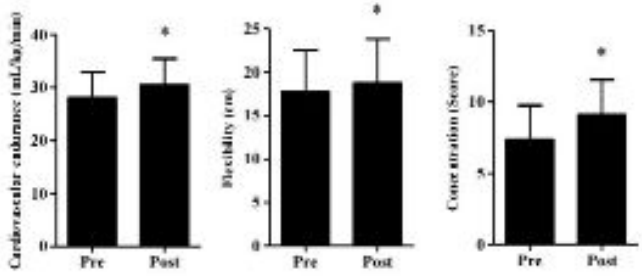

Figure 1. Results of statistical analysis of cardiovascular endurance, flexibility, and concentration between pretest vs. posttest. Description: (*)Significant vs. Pretest ($p \leq 0.001$). p-value was obtained by using the Paired Sample T-Test. Data are presented with Mean ± Standard Deviation (SD).

Discussion

Based on the results of the study, there was a significant increase in the average cardiovascular endurance between before and after the low impact aerobic exercise dance video intervention (Figure 1). Such results with the research results of Said et al. (2015) reported that a low-impact aerobic exercise intervention significantly improved aerobic fitness in overweight and obese women. Kwannai (2020) also reported that there was an increase in maximal oxygen consumption (VO_2max) after aerobic dance exercise. This increase in cardiovascular endurance may be due to increased skeletal muscle contraction during low-impact aerobic exercise.

The exercise dance intervention effectively prevents the decline in physical function, cognitive function, and quality of life associated with aging. Physical functions include balance, endurance performance, flexibility, muscle strength, and mobility, and a decline in these abilities is considered a sign of aging (Liu et al., 2021). This is in line with the results of the study that we found that low impact aerobic exercise dance performed for 30 minutes/exercise session with an intensity of 75-85% HRmax with a frequency of 3 times/week for 6 weeks increased flexibility. Physical activity causes changes in body balance (homeostasis). Changes in balance start from the body's response by the nervous system, then internal hormones will affect the muscles from which there will be a gradual change in body balance. In addition, exercise responds to changes in the body's metabolism, hormonal system, neuromuscular system, cardiovascular system, and respiratory system. The function of exercise in the musculoskeletal system is to increase aerobic metabolism, the number and size of mitochondria, regulation of blood flow in muscles, myoglobin in skeletal muscles, muscle hypertrophy, as well as metabolic range, joint mobility and flexibility (Saryono, 2011).

Aerobic exercise can also strengthen memory in adults who have mild cognitive impairment (Wong et al., 2020). Several other studies state that aerobic exercise can improve cardiorespiratory fitness, prevent several diseases related to age, improve physical and cognitive, and psychological conditions (Vrinceanu et al., 2019). Most of these athletes prove their behavior and performance on mental training, especially increased attention or concentration (Manikam, 2021). Aerobics dance also involves focusing attention, memory, sensory stimulation, and social interaction. Aerobics dance is a good exercise to improve cognitive, mood and physical function (Wong et al., 2020). The results of our study showed that there was a significant increase in the average concentration between before and after the low impact aerobic exercise dance video intervention (Figure 1). The results of research conducted by Johar et al. (2012) reported that a low-impact aerobic dance exercise intervention carried out for 50 minutes, 3 days per week, for 12 weeks reduced psychological health (stress) in sedentary women. Physical activity will improve the cognitive function of the brain (Pranoto et al., 2020), one of which is the function of attention which results in an increase in one's concentration (Samuel et al., 2017). This physical activity also affects the frontal lobe, an area of the brain for concentration, mental and planning. Good and structured physical activity can encourage someone to be physically active and show a positive effect on academic scores, including increased concentration (Ambardini, 2009). Increased concentration is also supported by the presence of

Sensory Motor Rhythm (SMR) waves that are delivered by nerves in the brain. These waves include low beta vibrations and have a frequency of around 12-16 Hz (Ulfa, 2017).

Conclusion

Based on the results of our study, it was concluded that a low impact aerobic exercise dance videos performed for 30 minutes/exercise session with an intensity of 75-85% HRmax with a frequency of 3 times/week for 6 weeks increased cardiovascular endurance, flexibility, and concentration in a female adolescent with a sedentary lifestyle. The results of this study cannot be generalized by gender, so future research is recommended to compare the effects of low impact aerobic exercise dance videos on increasing cardiovascular endurance, flexibility, and concentration in male and female adolescents. Further research is also suggested to compare dance videos of low impact aerobic exercise dance videos versus aerobic exercise dance videos.

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Conflict of interest

All authors declare no conflict of interest.

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ВПЛИВ ВИКОНАННЯ ПРЕДСТАВЛЕНИХ НА ВІДЕОЗАПИСІ ВПРАВ ІЗ ТАНЦЮВАЛЬНОЇ АЕРОБІКИ З НИЗЬКИМ УДАРНИМ НАВАНТАЖЕННЯМ НА СЕРЦЕВО-СУДИННУ ВИТРИВАЛІСТЬ, ГНУЧКІСТЬ І КОНЦЕНТРАЦІЮ УВАГИ В ЖІНОК, ЯКІ ВЕДУТЬ МАЛОРУХЛИВИЙ СПОСІБ ЖИТТЯ

Поппі Елісано Арфанда[1ABCD], Осе Віріаван[1ABCD], Харі Сетіджоно[1ABCD], Нінінг Відья Кусманік[1ABCD], Герянто Нур Мухаммад[1ABCD], Пусподарі[1ABCD], Новадрі Аюбі[1ABCD], Іанс Апріло[2ABCD], Арімбі[2ABCD]

[1]Сурабайський державний університет
[2]Макассарський державний університет

Авторський вклад: A – дизайн дослідження; B – збір даних; C – статаналіз; D – підготовка рукопису; E – збір коштів

Реферат. Стаття: 6 с., 1 табл., 1 рис., 36 джерел.

Метою дослідження було довести ефективність впливу виконання представлених на відеозаписі вправ із танцювальної аеробіки з низьким ударним навантаженням на серцево-судинну витривалість, гнучкість і концентрацію уваги в жінок, які ведуть малорухливий спосіб життя.

Матеріали та методи. У цьому дослідженні використовували доекспериментальний метод із планом дворазового попереднього та підсумкового тестування на одній групі. У дослідженні брали участь загалом 18 жінок віком 18-20 років, з індексом маси тіла (ІМТ) 19 кг/м^2 – 24 кг/м^2, з нормальним систолічним і діастолічним артеріальним тиском, з нормальною частотою серцевих скорочень у стані спокою, з показником насиченості крові киснем (SpO_2) 96% – 100%. Вправи

з танцювальної аеробіки з низьким ударним навантаженням виконували з використанням відеозапису протягом 30 хв/тренування з інтенсивністю 75% – 85% максимальної ЧСС (HRmax) із частотою 3 рази/тиждень протягом 6 тижнів. Вимірювання серцево-судинної витривалості здійснювали за допомогою багатоетапного тесту функціонального стану за результатами човникового бігу на 20 м, вимірювання гнучкості – за допомогою тесту на нахил тулуба вперед із положення сидячи, а вимірювання концентрації уваги – за допомогою тесту-решітки на концентрацію уваги. Як метод статистичного аналізу використовували t-критерій Стьюдента для парних вибірок із рівнем значущості 5%.

Результати. Результати показали середні значення показників попередніх вимірювань у порівнянні з показниками підсумкових вимірювань серцево-судинної витривалості (28,13 ± 4,80 проти 30,52 ± 0,88 мл/кг/хв ($p \leq 0,001$)), середні значення показників попередніх вимірювань у порівнянні з показниками підсумкових вимірювань гнучкості (17,79 ± 4,72 проти 18,75 + 5,02 см ($p < 0,001$)), середні значення показників попередніх вимірювань у порівнянні з показниками підсумкових вимірювань концентрації уваги (7,39 ± 2,38 проти 9,11 ± 2,45 очка ($p \leq 0,001$)).

Висновки. На підставі результатів дослідження було зроблено висновок про те, що виконання представлених на відеозаписі вправ із танцювальної аеробіки з низьким ударним навантаженням із частотою 3 рази/тиждень протягом 6 тижнів підвищило показники серцево-судинної витривалості, гнучкості та концентрації уваги в молодих жінок, які ведуть малорухливий спосіб життя.

Ключові слова: вправи з танцювальної аеробіки, серцево-судинна витривалість, гнучкість, концентрація уваги, малорухливий спосіб життя.

Information about the authors:

Poppy Elisano Arfanda: poppy.20014@mhs.unesa.ac.id; https://orcid.org/0000-0002-8191-6912; Doctoral Program of Sport Science, Postgraduate Program, Universitas Negeri Surabaya, Lidah Wetan Street, Surabaya, East Java 60213, Indonesia.

Oce Wiriawan: ocewiriawan@unesa.ac.id; https://orcid.org/0000-0003-1830-9519; Department of Sport Coaching Education, Faculty of Sport Science, Universitas Negeri Surabaya, Lidah Wetan Street, Surabaya, East Java 60213, Indonesia.

Hari Setijono: harisetijono@yahoo.co.id; https://orcid.org/0000-0001-8305-4933; Department of Sport Science, Faculty of Sport Science, Universitas Negeri Surabaya, Lidah Wetan Street, Surabaya, East Java 60213, Indonesia.

Nining Widyah Kusnanik: niningwidyah@unesa.ac.id; https://orcid.org/0000-0002-0734-6843; Department of Sport Coaching Education, Faculty of Sport Science, Universitas Negeri Surabaya, Lidah Wetan Street, Surabaya, East Java 60213, Indonesia.

Heryanto Nur Muhammad: heryantomuhammad@unesa.ac.id; https://orcid.org/0000-0001-8878-3991; Department of Physical Education, Health, and Recreation, Faculty of Sport Science, Universitas Negeri Surabaya, Lidah Wetan Street, Surabaya, East Java 60213, Indonesia.

Puspodari: puspodari.20012@mhs.unesa.ac.id; https://orcid.org/0000-0002-1753-4127; Doctoral Program of Sport Science, Postgraduate Program, Universitas Negeri Surabaya, Lidah Wetan Street, Surabaya, East Java 60213, Indonesia.

Novadri Ayubi: novadriayubii@yahoo.com; https://orcid.org/0000-0002-5196-6636; Doctoral Program of Sport Science, Postgraduate Program, Universitas Negeri Surabaya, Lidah Wetan Street, Surabaya, East Java 60213, Indonesia.

Ians Aprilo: ians.aprilo@unm.ac.id; https://orcid.org/0000-0002-3194-4659; Department of Physical Education, Health, and Recreation, Faculty of Sport Science, Universitas Negeri Makassar, Wijaya Kusuma No. 14 Street, Makassar, South Sulawesi 90222, Indonesia.

Arimbi: arimbi@unm.ac.id; https://orcid.org/0000-0002-1962-3203; Department of Sport Science, Faculty of Sport Science, Universitas Negeri Makassar, Wijaya Kusuma No. 14 Street, Makassar, South Sulawesi 90222, Indonesia.

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