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Comparing the Impact of Traditional vs. Modern Music in Aerobic Dance on Cardiovascular Endurance Improvement

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Abstract

This study aims to compare the effect of aerobic dance accompanied by traditional and modern music on increasing the cardiovascular endurance of students. The research design used was a quasi-experiment with a pretest-posttest group design. The sample consisted of 40 students of Makassar State University who were divided into two groups: an aerobic dance group with traditional South Sulawesi music and an exercise group with popular modern music. The exercise was carried out for six weeks, three times a week, for 45 minutes per session. Data were collected through a multistage test (beep test) to measure VO_2 max and analyzed using parametric statistical tests. The results showed that both groups experienced a significant increase in cardiovascular endurance ($p < 0.05$). However, a greater increase occurred in the traditional music group ($\Delta = 3.34$) than in the modern music group ($\Delta = 2.39$). These findings indicate that traditional music accompaniment is more effective in increasing cardiovascular endurance and providing added value in the context of preserving local culture.

How to Cite

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INTRODUCTION

Cardiovascular endurance, as one of the main indicators of physical fitness, reflects the efficiency of vital organs, specifically the heart, lungs, and circulatory system, in optimally supporting continuous physical activities over a relatively long duration (Kokkinos & Myers, 2024; Kokkinos, 2025; Franklin et al., 2022). Low levels of cardiovascular fitness can negatively impact various aspects of life by reducing the body's ability to perform daily activities optimally, which in turn may decrease productivity, hinder concentration in the learning process, and affect overall quality of life both physically and mentally (Franklin et al., 2022; Köble et al., 2022; Chen et al., 2021). Based on the results of initial observations of 40 students at Makassar State University, it was found that more than 57.5% of students showed a low cardiovascular endurance category based on the results of the multistage test. This finding is a serious concern, considering that students are in a productive age phase that demands optimal physical fitness.

Aerobic dance, a form of physical activity performed rhythmically and continuously with measurable intensity, has been scientifically proven effective in improving cardiovascular endurance by stimulating the heart and lungs to function optimally during exercise (Preobrazenski et al., 2025; Dimitriadis et al., 2025; Arfanda et al., 2022). This activity involves a series of rhythmic movements performed in a structured and repetitive manner, following a specific pattern typically aligned with the rhythm of accompanying music, and carried out over a set duration with varying intensities—from moderate to high—to provide significant stimulation to the cardiovascular system (Popescu et al., 2021; Kyselovičová & Zemková, 2024; Pang et al., 2024). Aerobic dance has great potential to stimulate the performance of vital organs such as the heart and lungs, especially when performed with a clear exercise pattern and following proper training principles, as regular and structured implementation enables the body to progressively adapt to the training load, thereby optimizing cardiovascular capacity (Franklin et al., 2023; Nicoletti et al., 2025; Huang et al., 2025).

Along with the development of the times and changes in people's lifestyles, aerobic dance has transformed just a physical fitness activity to a more dynamic and interesting form of sport. In addition to functioning as a medium to improve health and fitness, aerobic dance is now also used as a means of fun entertainment, because it is combined with music, creative choreography, and an energetic atmosphere (Chayun et al., 2020; Arfanda, Aprilo, et al., 2022; Arfanda et al., 2023). In the practice of aerobic gymnastics, the presence of musical elements becomes an inseparable element because it functions as a rhythmic guide for participants in following each series of movements. Music not only helps regulate the rhythm and tempo of the movements but also plays a role in determining the intensity of the exercise and creating a pleasant, motivating, and energetic atmosphere during the session (Song et al., 2024; Li et al., 2022; Park et al., 2023).

Modern music is often the main choice in the implementation of aerobic because it has characteristics that are in line with the needs of intense and rhythmic physical exercise. Energetic rhythms, fast tempos, and dynamic tones not only raise the spirit of participants, but are also able to increase motivation and maintain consistency of movement during the training session. In addition, music with a fast rhythm has been proven to increase motivation and improve the efficiency of heart work during exercise, thus supporting the achievement of fitness goals more optimally (Jones et al., 2024; Kose & Atli, 2019; Pusey et al., 2023). The type of music can create high spirits and maintain participant motivation during training. However, traditional music also has great potential as an accompaniment to gymnastics (Delleli et al., 2023; Terry et al., 2019; Greco et al., 2022). Music such as Tenggang-tenggang Lopi, Marendeng Marampa, Ambo Logo and Anging Mamiri from South Sulawesi have distinctive rhythms and strong local cultural values. Traditional music not only offers unique aesthetics, but can also raise spirits and create a deeper atmosphere. This is especially true for participants who have an emotional closeness to their native culture, because the music can strengthen the sense of attachment and motivation in following the training (Good et al., 2021; Sheppard & Broughton, 2020; Maria et al., 2022).

Several studies have highlighted aspects of modern or popular music, and not many have directly compared the effectiveness of traditional and modern music in the context of physical exercise, especially on cardiovascular endurance. Based on these conditions, this study has a unique position, namely, directly comparing the effects of aerobic dance accompanied by traditional and modern music on increasing cardiovascular endurance. This study is expected to provide scientific contributions in the development of exercise models that are not only effective in physiological aspects, but also socially and culturally relevant.

METHODS

This study used a quantitative approach with a quasi-experimental design of the pretest-posttest group design type. This design was chosen to observe changes in cardiovascular endurance before and after aerobic dance treatment with two different types of musical accompaniment, namely traditional South Sulawesi music and modern music. The population in this study was all active students at Makassar State University as one of the universities in Makassar City. The research sample consisted of 40 students selected by purposive sampling with the criteria of being between 18-22 years old, in good physical condition, and having never participated in a routine physical exercise program in the last three months. The sample was then divided ordinally into two groups, the first group was the aerobic exercise group with traditional South Sulawesi music accompaniment, and the second group was the aerobic exercise group with modern music accompaniment. The criteria for this aerobic dance are low-impact aerobic dance, namely movements performed with the feet not leaving the floor, and there is no pressure on the joint area. The beat of the music accompaniment every minute is between 135-158 BPM (beats per minute). This music tempo is called allegro. There are two variables in this study, namely the independent variable, which includes the accompaniment of traditional South Sulawesi music and modern music, and the dependent variable, namely cardiovascular endurance measured by the multistage fitness test or beep test, which has been validated as a measure of aerobic capacity and cardiovascular endurance. The participants' VO_2 max was calculated using a standard formula based on the level and time of achievement in the test. Data were collected twice, namely when the pretest was carried out before the treatment was given and the posttest was carried out after six weeks of treatment. Both groups followed an aerobic dance program for 6 weeks with a training frequency of 3 times per week, a training duration of 45 minutes per session, and a training intensity set between 50-70% of the maximum heart rate. Group A followed aerobic exercise accompanied by local traditional music, Tenggang-tenggang Lopi, Marendeng Marampa, Ambo Logo, and Anging Mamiri, which had been arranged according to the BPM in low-impact aerobic exercise, and group B followed aerobic exercise accompanied by popular modern music. The exercise activities were guided by certified instructors and carried out in the same open space to ensure equality of environmental conditions. Data were analyzed using parametric statistical tests. The paired sample t-test was used to measure the differences between the pretest and posttest in each group. Meanwhile, to determine the differences between groups, the independent sample t-test was used with a significance level of 0.05.

RESULTS AND DISCUSSION

The results of the descriptive analysis are used to provide an overview of the results of the research that has been conducted. After six weeks of treatment, the results of the participants' cardiovascular endurance measurements were analyzed using a multistage test to obtain VO_2 max values. The following **Table 1** presents a summary of the pretest and posttest data from both groups.

Table 1. Descriptive Statistical Data of Cardiovascular Endurance Improvement

Group		N	Min	Max	Mean	SD
Traditional music aerobic dance	Pretest	20	20.4	39.9	27.87	5.51
	Posts		23.60	43.0	31.21	5.57
	Delta				3.34	
Modern music aerobic dance	Pretest	20	21.10	38.5	28.13	4.80
	Posts		24.30	39.9	30.52	4.88
	Delta				2.39	

Table 1 shows that each group consisted of 20 participants. Measurements were made on three main statistical indicators, namely minimum (Min), maximum (Max), mean (Mean), and standard deviation (SD). There was an average increase in cardiovascular endurance of 3.34 points in the traditional music aerobics group after being given treatment, which indicates that this method is quite effective in increasing endurance. The modern music aerobic dance group also showed an average increase of 2.39 points, but lower than the traditional music aerobic dance group.

Table 2. Normality Test

Group		N	Sig	Information
Traditional music aerobic dance	Pretest	20	0.117	Normal
	Posts		0.298	Normal
	Delta		0.139	Normal
Modern music aerobic dance	Pretest	20	0.346	Normal
	Posts		0.88	Normal
	Delta		0.199	Normal

Table 2 presents the results of the normality test on the pretest, posttest, and delta data from two treatment groups, namely aerobic dance with traditional music and aerobic dance with modern music. The normality test was carried out using the Shapiro-Wilk Test, with a sample size of 20 people in each group. All data in both groups, both at the pretest, posttest, and delta, showed a significance value greater than 0.05, so it can be concluded that all data are normally distributed.

Table 3. Homogeneity Test

		Levene Statistics	Sig	Information
Cardiovascular Endurance	Pretest	0.782	0.463	Homogene
	Posts	0.825	0.444	Homogene
	Delta	0.361	0.699	Homogene

Table 3 presents the results of the homogeneity of variance test for cardiovascular endurance data at the time of the pretest, posttest, and delta (difference between posttest and pretest) of the two treatment groups. The test was conducted using Levene's Test. Based on the results of Levene's Test, all data (pretest, posttest, and delta) showed a significance value greater than 0.05.

Table 4. Paired Sample T Test Results

Group		Sig	Information
Traditional music aerobic dance	Pretest	0.00	Influential
	Posts	0.00	Influential
Modern music aerobic dance	Pretest	0.00	Influential
	Posts	0.00	Influential

Table 4 shows the results of the Paired Sample T-Test used to determine whether there is a significant difference between the pretest and posttest scores in the two treatment groups, namely aerobic dance with traditional music and aerobic dance with modern music. This test was conducted to examine the effect of exercise treatment on increasing cardiovascular endurance. The significance value (Sig. 2-tailed) <0.05, so there is a significant effect between the pretest and posttest. Both groups showed a significant effect after following the aerobic dance program. This means that both aerobic dance with traditional music and modern music are equally effective in increasing the cardiovascular endurance of participants.

The results of the study showed that aerobic dance, both accompanied by traditional and modern music, was effective in increasing the cardiovascular endurance of students. This effectiveness was demonstrated through the results of the paired sample t-test, which showed a significant value ($p < 0.05$) in both groups, which means there was a significant difference between the pretest and posttest results after treatment. This finding indicates that aerobic dance carried out in a structured manner can stimulate the cardiovascular system optimally. Music can influence physiological and psychological responses during physical activity, thereby increasing performance and endurance (Delleli et al., 2023; Poon et al., 2024; Jebabli et al., 2023). This study also supports previous findings that aerobic dance is an effective method for improving cardiovascular fitness (Ahmed et al., 2022; Khairullah & Norlinta, 2023; Milani et al., 2024).

Interestingly, the group that trained with traditional music experienced a greater increase in cardiovascular endurance than the modern music group. This finding is important because it shows the strong influence of emotional closeness and cultural values contained in traditional music, such as Tenggang-tenggang Lopi, Marendeng Marampa, Ambo Logo, and Anging Mamiri. These musics not only function as a tempo regulator for movements, but is also able to raise spirits, create psychological comfort, and strengthen participants' sense of cultural identity. The familiar local nuance provides a deeper emotional experience, improves mood and enthusiasm during training, and encourages strong intrinsic motivation. With high emotional involvement, participants tend to put in more effort in each training session, so that the training results are more optimal.

Traditional music or music that has a cultural closeness to the participants can create a more meaningful exercise experience because it involves the affective aspect in depth. Emotionally familiar regional music can increase motivation, strengthen cultural identity, and create a pleasant atmosphere during exercise. Other studies have also revealed that music chosen by participants themselves, including traditional music, significantly increases motivation, positive mood, and satisfaction with the exercise experience. In addition, activities such as singing traditional songs together have been shown to increase social participation and psychological well-being. Thus, traditional music not only functions as an accompaniment to movement, but also has the power to shape the emotional and social involvement of participants, which ultimately has a positive impact on the overall quality of exercise (Terry et al., 2019; Ying & Subramaniam, 2021; Blasco-Magraner et al., 2023).

Traditional music or regional music can

provide a deeper emotional experience compared to popular music, especially for individuals who come from the same cultural background. Culturally familiar music can evoke stronger bodily sensations and emotional responses, with higher intensity when the music comes from the listener's own culture. The expression and perception of emotions towards music are strongly influenced by cultural context, so that individuals from the same cultural background tend to show more consistent emotional responses to traditional music. The majority of participants who listened to musical compositions familiar from their culture experienced similar emotions, reflecting a high emotional closeness to local music. Involvement in cross-cultural music has been known to increase empathy and social connection, further emphasizing the importance of cultural closeness in deepening affective experiences. Thus, regional music not only functions as entertainment or accompaniment to activities but also has the power to build deep emotional involvement, making it very effective in creating meaningful exercise experiences (Begić et al., 2025; Celen et al., 2025; MG Li et al., 2023).

The use of traditional music in aerobic dance not only has a positive impact on physiological aspects but also strengthens the sense of cultural identity and social connectedness among participants. Aerobic dance based on the local culture of South Sulawesi can increase physical activity while building appreciation for cultural heritage (Arfanda, Aprilo, Arimbi, et al., 2023). Traditional music selected based on cultural proximity can significantly increase motivation, enjoyment, and physical performance.(Song et al., 2024). Pre-workout music that has cultural content enhances the psychological effects and performance of athletes (Delleli et al., 2023; Delabary et al., 2020). Culturally based physical activity can improve fitness while strengthening social identity, especially in older age groups (Sheppard & Broughton, 2020). Thus, the integration of traditional music elements into aerobic dance can create a more emotionally and socially meaningful exercise experience, as well as encourage increased motivation and physical performance of participants.

The use of traditional music as accompaniment in aerobic dance is not only an effective alternative in improving physical fitness, but also an innovative approach that integrates sports with the preservation of local culture. The integration of cultural elements in fitness programs not only enriches the training experience of participants but also opens up opportunities to maintain and strengthen cultural identity through a functional, fun, and meaningful approach. These findings provide a strong basis for the implementation of local wisdom-based aerobic dance as part of the promotion of a healthy lifestyle, especially in the context of physical education and the development of fitness programs in the college environment.

CONCLUSION

This study shows that aerobic dance, both accompanied by traditional music and modern music, has a significant effect on increasing the cardiovascular endurance of students. However, a higher increase was found in the group that practiced with traditional music. This finding indicates that traditional music not only functions as an exercise accompaniment but also has an important role in raising the spirit, motivation, and emotional involvement of participants. Traditional music such as Tenggang-tenggang Lopi, Marendeng Marampa, Ambo Logo, and Anging Mamiri from South Sulawesi carries a strong local nuance and can strengthen cultural closeness, thus creating a more meaningful exercise experience and having an impact on physical performance. Therefore, the use of traditional music as an accompaniment to aerobic dance can be an innovative alternative in developing physical fitness programs in the university environment. In addition to being physiologically effective, this approach also contributes to the preservation of local culture in a way that is psychologically and socially relevant.

REFERENCES

Ahmed, I., Inam, A. Bin, Belli, S., Ahmad, J., Khalil, W., & Jafar, M. M. (2022). Effectiveness of aerobic exercise training program on cardiorespiratory fitness and quality of life in patients recovered from COVID-19. European Journal of Physiotherapy, 24(6), 358–363. https://doi.org/10.1080/21679169.2021.1909649

Arfanda, P. E., Aprilo, I., & Alamsyah, N. F. (2022). Sarana Pengembangan Olahraga Rekreasi : Senam Aerobik Dangdut Berbasis Budaya Lokal Sulawesi Selatan. In P. E. Arfanda (Ed.), Rekognisi Pendidikan, Olahraga, dan Kesehatan (1st ed., pp. 10–19). PT. Nasya Expanding Management. https://www.google.co.id/books/edition/Rekognisi_Pendidikan_Olahraga_dan_Keseha/Y551EAAAQBAJ?hl=id&gbpv=0

Arfanda, P. E., Aprilo, I., Arimbi, Nurliani, & Wahid, W. M. (2023). Socialization of Aerobic Exercise Based on Culture in South Sulawesi. J-

Abdi Jurnal Pengabdian Kepada Masyarakat, 3(6), 104–116.

Arfanda, P. E., Aprilo, I., Muhammad, H. N., & Puspodari, P. (2023). Utilization of Public Open Space Area Facilities as an Alternative to Aerobic Dance Exercise. Journal of Physical Education, 12(2), 98–103. http://journal.unnes.ac.id/sju/index.php/peshr

Arfanda, P. E., Wiriawan, O., Setijono, H., Kusnanik, N. W., Muhammad, H. N., Puspodari, P., Ayubi, N., Aprilo, I., & Arimbi, A. (2022). The Effect of Low-Impact Aerobic Dance Exercise Video on Cardiovascular Endurance, Flexibility, and Concentration in Females With Sedentary Lifestyle. Teorìâ Ta Metodika Fìzičnogo Vihovannâ, 22(3), 303–308. https://doi.org/10.17309/tmfv.2022.3.01

Begić, A., Begić, J. Š., & Stehlik, Ž. (2025). Emotional experience of listening to music among Croatian music school students. X(X). https://doi.org/10.36922/ac.6009

Blasco-Magraner, J. S., Bernabé-Valero, G., Marín-Liébana, P., & Botella-Nicolás, A. M. (2023). Changing positive and negative affects through music experiences: a study with university students. BMC Psychology, 11(1), 1–13. https://doi.org/10.1186/s40359-023-01110-9

Celen, E., van Rijn, P., Lee, H., & Jacoby, N. (2025). Are Expressions for Music Emotions the Same Across Cultures? http://arxiv.org/abs/2502.08744

Chayun, D., Kletsov, K., & Manzheley, I. (2020). Acrobatics as a new trend in aerobic gymnastics. Journal of Physical Education and Sport, 20(2), 759–767. https://doi.org/10.7752/jpes.2020.02109

Chen, W., Wang, X., Gu, X., & Chen, J. (2021). The impacts of coordinated-bilateral ball skills intervention on attention and concentration, and cardiorespiratory fitness among fourth-grade students. International Journal of Environmental Research and Public Health, 18(21). https://doi.org/10.3390/ijerph182111634

Delabary, M. D. S., Monteiro, E. P., Donida, R. G., Wolffenbuttel, M., Peyré-Tartaruga, L. A., & Haas, A. N. (2020). Can Samba and Forró Brazilian rhythmic dance be more effective than walking in improving functional mobility and spatiotemporal gait parameters in patients with Parkinson's disease? BMC Neurology, 20(1), 1–10. https://doi.org/10.1186/s12883-020-01878-y

Delleli, S., Ouergui, I., Ballmann, C. G., Messaoudi, H., Trabelsi, K., Ardigò, L. P., & Chtourou, H. (2023). The effects of pre-task music on exercise performance and associated psycho-physiological responses: a systematic review with multilevel meta-analysis of controlled studies. Frontiers in Psychology, 14(November). https://doi.org/10.3389/fpsyg.2023.1293783

Dimitriadis, N., Arnaoutis, G., Chrysohoou, C., Barkas, F., Liberopoulos, E., Sfikakis, P. P., Pitsavos, C., Tsioufis, C., Tambalis, K. D., & Panagiotakos, D. (2025). Assessment of Long-Term Engagement in Aerobic Versus Resistance Exercise on 20-Year Cardiovascular Disease Incidence (2002–2024): The ATTICA Epidemiological Cohort Study. Journal of Clinical Medicine, 14(2), 1–12. https://doi.org/10.3390/jcm14020522

Franklin, B. A., Eijsvogels, T. M. H., Pandey, A., Quindry, J., & Toth, P. P. (2022). Physical activity, cardiorespiratory fitness, and cardiovascular health: A clinical practice statement of the American Society for Preventive Cardiology Part II: Physical activity, cardiorespiratory fitness, minimum and goal intensities for exercise train. American Journal of Preventive Cardiology, 12(September), 100425. https://doi.org/10.1016/j.ajpc.2022.100425

Franklin, B. A., Wedig, I. J., Sallis, R. E., Lavie, C. J., & Elmer, S. J. (2023). Physical Activity and Cardiorespiratory Fitness as Modulators of Health Outcomes: A Compelling Research-Based Case Presented to the Medical Community. Mayo Clinic Proceedings, 98(2), 316–331. https://doi.org/10.1016/j.mayocp.2022.09.011

Good, A., Sims, L., Clarke, K., & Russo, F. A. (2021). Indigenous youth reconnect with cultural identity: The evaluation of a community- and school-based traditional music program. Journal of Community Psychology, 49(2), 588–604. https://doi.org/10.1002/jcop.22481

Greco, F., Grazioli, E., Cosco, L. F., Parisi, A., Bertollo, M., & Emerenziani, G. Pietro. (2022). The effects of music on cardiorespiratory endurance and muscular fitness in recreationally active individuals: a narrative review. PeerJ, 10, 1–14. https://doi.org/10.7717/peerj.13332

Huang, Z., Xu, X., Leng, Y., Ke, Z., Tang, Z., Fan, Z., Dai, R., Liao, X., Zhuang, X., & Liang, Q. (2025). Aerobic Exercise Training, Biological Age, and Mortality in Chronic Heart Failure With Reduced Ejection Fraction. JACC: Advances, 4(4). https://doi.org/10.1016/j.jacadv.2025.101659

Jebabli, N., Ben Aabderrahman, A., Boullosa, D., Chtourou, H., Ouerghi, N., Rhibi, F., Govindasamy, K., Saeidi, A., Clark, C. C. T., Granacher, U., & Zouhal, H. (2023). Listening to music during a repeated sprint test improves performance and psychophysiological responses in healthy and physically active male adults. BMC Sports Science, Medicine and Rehabilitation, 15(1), 1–9. https://doi.org/10.1186/s13102-023-00619-1

Jones, L., Karageorghis, C. I., Ker, T., Rushton, C. J., Stephenson, S. R., & Wheeldon, I. L. (2024). The exercise intensity–music-tempo preference relationship: A decennial revisit. Psychology of Sport and Exercise, 74, 102644. https://doi.org/10.1016/j.psychsport.2024.102644

Khairullah, R. R., & Norlinta, S. N. O. (2023). The Effect of Aaerobic Exercise on Functional Ca-

pacity Increase in Coronary Heart Disease Patients: A Narrative Review. FISIO MU: Physiotherapy Evidences, 4(1), 23–39. https://doi.org/10.23917/fisiomu.v4i1.19791

Köble, K., Postler, T., Oberhoffer-Fritz, R., & Schulz, T. (2022). A Better Cardiopulmonary Fitness Is Associated with Improved Concentration Level and Health-Related Quality of Life in Primary School Children. Journal of Clinical Medicine, 11(5). https://doi.org/10.3390/jcm11051326

Kokkinos, P. (2025). Current Concepts on Cardiorespiratory Fitness , and Health Outcomes : A Brief Review. 4–8.

Kokkinos, P., & Myers, J. (2024). Cardiorespiratory Fitness and Health Outcomes Across the Spectra of Age, Gender, and Race. Reviews in Cardiovascular Medicine, 25(1), 1–3. https://doi.org/10.31083/j.rcm2501015

Köse, B., & Atli, A. (2019). Effect of different music tempos on aerobic performance and recovery. Progress in Nutrition, 21(4), 922–927. https://doi.org/10.23751/pn.v21i4.8880

Kyselovičová, O., & Zemková, E. (2024). The effects of aerobic gymnastics training on performance-related variables in an elite athlete: a 2-year follow-up study. Frontiers in Physiology, 15(June), 1–11. https://doi.org/10.3389/fphys.2024.1380024

Li, C., Jin, C., Zhang, Z., & Shi, P. (2022). Music recharges people: Synchronized music during aerobic exercise leads to better selfregulation performance. PLoS ONE, 17(12 December), 1–14. https://doi.org/10.1371/journal.pone.0278062

Li, M. G., Olsen, K. N., Davidson, J. W., & Thompson, W. F. (2023). Rich Intercultural Music Engagement Enhances Cultural Understanding: The Impact of Learning a Musical Instrument Outside of One's Lived Experience. International Journal of Environmental Research and Public Health, 20(3). https://doi.org/10.3390/ijerph20031919

Milani, J. G. P. O., Milani, M., Verboven, K., Cipriano, G., & Hansen, D. (2024). Exercise intensity prescription in cardiovascular rehabilitation: bridging the gap between best evidence and clinical practice. Frontiers in Cardiovascular Medicine, 11(August). https://doi.org/10.3389/fcvm.2024.1380639

Morgado, E. M. G., Licursi, M. B., & da Silva, L. L. F. (2022). Music, rhythmic gymnastics and expressiveness: an artistic performance. Motricidade, 18(4), 590–595. https://doi.org/10.6063/motricidade.25789

Nicoletti, R. A., de Souza, T. P., Miotto, D. S., Duchatsch, F., Tardelli, L. P., de Paula, V. F., Amaral, S. L., & Zago, A. S. (2025). Aerobic Exercise Practiced Over Time Mitigates the Structural Effects on the Vascular System Caused by the Deleterious Effects of Aging. Vascular Health and Risk Management, 21(January), 125–138. https://doi.org/10.2147/VHRM.S478482

Pang, Y., Mazlan, A. N., & Bai, D. (2024). The advance of research on rhythmic gymnastics. Journal of Infrastructure, Policy and Development, 8(12), 1–13. https://doi.org/10.24294/jipd.v8i12.9363

Park, K. S., Williams, D. M., & Etnier, J. L. (2023). Exploring the use of music to promote physical activity: From the viewpoint of psychological hedonism. Frontiers in Psychology, 14(January), 1–12. https://doi.org/10.3389/fpsyg.2023.1021825

Poon, E. T. C., Kwan, W. L., Chow, C. C., & Chan, D. K. C. (2024). Music Timing Differentiates Fatigue Perception and Performance during Isometric Strength Exercises: A Crossover Randomised Trial. Journal of Sports Science and Medicine, 23(1), 258–264. https://doi.org/10.52082/jssm.2024.258

Popescu, G., Dina, L., & Stroescu, S. (2021). Transformations and contradictions in elite aerobic gymnastics. Discobolul – Physical Education, Sport and Kinetotherapy Journal, 60, 635–645. https://doi.org/10.35189/dpeskj.2021.60.s10

Preobrazenski, N., Mladen, S. P. S., Causer, E., Menezes, E., Islam, H., Drouin, P. J., Tschakovsky, M. E., & Gurd, B. J. (2025). Mitochondrial and cardiovascular responses to aerobic exercise training in supine and upright positions in healthy young adults : a randomized parallel arm trial. Translational Exercise Biomedicine, 2(1), 9–20. https://doi.org/10.1515/teb-2025-0002

Pusey, C. G., Haugen, T., Høigaard, R., Ivarsson, A., Røshol, A. W., & Laxdal, A. (2023). Put Some Music on: The Effects of pre-Task Music Tempo on Arousal, Affective State, Perceived Exertion, and Anaerobic Performance. Music and Science, 6, 1–9. https://doi.org/10.1177/20592043231174388

Sheppard, A., & Broughton, M. C. (2020). Promoting wellbeing and health through active participation in music and dance: a systematic review. International Journal of Qualitative Studies on Health and Well-Being, 15(1). https://doi.org/10.1080/17482631.2020.1732526

Song, R., Motevalli, S., & Zhou, Y. (2024). Melodic Movements: The Role of Music in Shaping Sport Performance and Psychological Responses. International Sports Studies, 46(2), 96–124. https://doi.org/10.69665/iss.v46i2.24

Terry, P. C., Karageorghis, C. I., Curran, M. L., Martin, O. V., & Parsons-Smith, R. L. (2019). Effects of Music in Exercise and Sport: A Meta-Analytic Review. Psychological Bulletin, 146(2), 91–117. https://doi.org/10.1037/bul0000216

Ying, L. Y., & Subramaniam, A. (2021). Impact of music as motivation to perform exercises among university students - a survey. Journal of Experimental Biology and Agricultural Sciences, 9(Specialissue 1), 187–195. https://doi.org/10.18006/2021.9(SPL-1-GCSGD_2020).S187.S195.