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Enhancing Anaerobic Endurance in Student Futsal Players through Small-Sided Games Combined with High-Intensity Interval Training

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

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Abstract

Objectives. Futsal is a team sport that requires anaerobic support tactics and playing techniques, some of which include attack versus defend and high-intensity interval training (HIIT). The aim of this study was to determine the effect of training small-sided games with high-intensity interval training on the anaerobic endurance of futsal players.

Materials and methods. In this study, a one-group pretest-posttest design was used. The study population consisted of 25 players. 16 players were selected with an average age of 15.9 ± 0.5 years, height 158.1 ± 5.79 cm, weight 58.9 ± 9.79 kg, and BMI 19.9 ± 2.41. The research data were analyzed using the paired sample t-test.

Results. Based on the results of the paired sample t-test, it was found that the sig (2-tailed) values were 0.002 < 0.005, indicating a significant increase in anaerobic endurance.

Conclusions. It can be concluded that small-sided game training with high-intensity interval training contributes significantly to the improvement of anaerobic endurance in student futsal players.

Keywords: futsal, small-sided games, high-intensity interval training, anaerobic endurance.

Introduction

Futsal is an intermittent sport that requires high physical, technical, and tactical demands. Players engage in high-intensity locomotor activity and require both aerobic and anaerobic endurance (Barbero-Alvarez et al., 2008; Mendes et al., 2022; Ribeiro et al., 2020). Tactical ability is a crucial element for success in futsal. Futsal is a team sport that requires high intensity and involves physical abilities, techniques, and tactics. The game is characterized by short recovery periods (Da Cruz et al., 2020; Naser et al., 2017; Ohmuro et al., 2020). The game is also known for its high-intensity efforts and frequent sprinting activities, which necessitate players to perform at a high level of physical ability (Caetano et al., 2015). Futsal, like football, demands a comprehensive comprehension of tactical aspects such as attack, defense, and transition. This sport falls under the category of competitive sports, and players are able to maintain a specific formation during the game (Narizuka & Yamazaki, 2019). They must also be capable of fulfilling various roles, such as organizing attacks and guarding the defense, as part of a team. Proficiency in these tactics not only affects the outcome of the match but also reflects the caliber of the players and the team as a whole.

To play with high intensity and execute planned tactics, players must possess high anaerobic abilities, which require a high level of fitness. Supporting the application of tactics, techniques, and physicality in the game is crucial (Milioni et al., 2016). Anaerobic endurance refers to the body's ability to produce energy quickly and powerfully. Futsal sports demand high levels of anaerobic energy (Farhani et al., 2019). In intense matches like futsal, players must possess the physical strength to maintain high performance, pressure opponents, and actively participate in attacking and defensive patterns.

This research focuses on training that combines game tactics elements, including attack versus defense, with

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HIIT to meet these needs. The exercise uses the anaerobic energy system to improve physical abilities related to anaerobic energy, such as endurance and speed (Ouertatani et al., 2022). High-Intensity Interval Training (HIIT) is commonly utilized in soccer games due to the similarities in match intensity between soccer and futsal (Barnes et al., 2014; Hostrup & Bangsbo, 2023; Rodrigues et al., 2011). Previous research has explored the effects of HIIT on agility and dribbling skills in futsal (Wiranata et al., 2023), but its impact on the anaerobic endurance of futsal players can also enhance their tactics and on-field performance.

The importance of understanding how integrated high-intensity tactical and physical training can impact student soccer players makes this research urgent. The results of this study can provide valuable guidance for coaches and players to design more effective and targeted training programs to significantly improve futsal players' anaerobic endurance.

Materials and Methods

Study Participants

The total population used in this research was 25 players who participated in extracurricular activities. The sample used in this research was 16 randomly selected players. The characteristics of the sample used were 15.9 ± 0.5 years old, with a height of 158.1 ± 5.79 cm, a body mass of 58.9 ± 9.79 kg, and a BMI of 19.9 ± 2.41.

Study Organization

This study employed a one-group pre-test and post-test design. The research was conducted over a period of six weeks, with three sessions per week (Ziemann et al., 2011). Prior to treatment, subjects underwent a pre-test to establish baseline data on anaerobic capacity. A post-test was then administered after six weeks of treatment. The average difference for each subject was determined by analyzing the difference between the pre-test and post-test data. The research employed the Running-based Anaerobic Sprint Test (RAST) to train anaerobic endurance (Andrade et al., 2015). The RAST test requires participants to sprint as fast as possible over a certain distance, typically around 35 meters, with short rests between each sprint. The test consists of 6 sprints. The variables to be analyzed in RAST are peak power (W), minimum power (W), total effort time (s), and fatigue index (FI) (calculated as (peak power – minimum power)/peak power) × 100).

Training Program

This study involved 16 subjects divided into four groups, each consisting of four individuals. One group comprised two attacking players and two defensive players. The first group played Small Sided Games (SSG) 2 against 2 without a goalkeeper for 90 seconds in an area measuring 20×20 meters, with the target intensity reaching 80-90% of the maximum heart rate (HR max). Two small goal targets were placed at each end of the pitch to add a competitive element. Meanwhile, the other three groups waited in pairs outside the area while the training interval, consisting of 90 seconds of HIIT and 270 seconds of active recovery, was carried out. After completing the first repetition, each group alternated with the second group to continue the same exercise at 80-90% intensity for 90 seconds. This process continued until each group had completed 8 repetitions.

Statistical Analysis

The research utilized data analysis methods such as the Shapiro-Wilk normality test and the Paired Sample T-test to compare pre-test and post-test results. The significance level (Sig) was found to be less than 0.05.

Results

The results of the descriptive statistical analysis of the pre-test and post-test RAST of student futsal players are presented in the table below.

Table 1. Descriptive Statistics

Variable	Pretest	Posttest
Peak Power (w)	481.75±89.61	551.75±132.27
Minimum Power (w)	299.89±47.11	287.58±44.31
Total Effort Time (s)	34.23±1.20	33.93±1.53
Fatique Index (FI)	5.35±1.85	7.92±3.50

The data are presented by means ± SD

Table 1 presents the results of the descriptive statistical analysis, indicating an increase in scores from pre-test to post-test. In the pre-test, scores had a mean value of 5.35±1.85. In contrast, the average score in the post-test increased to 7.92±3.50. These findings suggest that the intervention led to improved performance among participants.

Table 2. Normality Test Results

Variable		Shapiro-Wilk		
		Statistics	N	Sig
Fatique Index	Pretest	0.909	16	0.112
	Post-test	0.903	16	0.089

The data is presented as means ± SD and statistical significance. To determine normality, the Shapiro-Wilk test was used, with data considered normal if the significance level was ≥0.05

Based on the results presented in Table 2, the normality test using the Shapiro-Wilk test instrument showed that the pre-test fatigue index value was 0.112, which is greater than the significance level of 0.05. Similarly, the post-test fatigue index value was 0.089, which is also greater than the significance level of 0.05. Therefore, all research data was normally distributed, and parametric statistics paired sample t-test was used for hypothesis testing. The data are presented as ± SD and significance values. According to the Shapiro-Wilk test, data is considered normal if the significance value is greater than 0.05.

According to the results presented in Table 3, the fatigue index data obtained from the hypothesis testing using the Paired Sample T-Test indicates a sig (2-tailed) value of

Table 3. Hypothesis Test Results

Paired Difference					T	df	Significance
Mean	Std. Dev.	Std. Error Mean	95% Confidence Interval of the Difference				Sig. (2- tailed)
			Lower	Upper			
-2,71	2,82	0,70	-4,22	-1,20	-3,84	15	0,002

The data is presented as means ± SD. Any statistically significant differences are denoted by a sig (2-tailed) value of ≤ 0.05 when comparing mean scores to the baseline

0.002<0.05. Therefore, it can be concluded that there is a significant increase in anaerobic endurance through SSG with HIIT.

Discussion

The aim of this study was to investigate the effects of SSG with HIIT on the anaerobic endurance of student futsal teams. The training was conducted for 1 month and 2 weeks, with a frequency of 3 meetings per week, while adhering to the principles of training and increasing the load every week. This study is consistent with previous research, which also administered treatment 3 times a week (Kumar & Pandey, 2023; Mashud et al., 2019; Yan et al., 2022). The research results indicate that SSG with HIIT has a positive effect on anaerobic endurance, as demonstrated by a decrease in the player's fatigue index.

Anaerobic endurance is increased through high-intensity exercise alternated with short rest periods. When high-intensity exercise is performed in the anaerobic zone for an average of 90 seconds, lactic acid is produced. In theory, if training is always conducted in the lactic anaerobic zone and is interspersed with short breaks, it will improve the lactic acid tolerance of the muscles. This will result in the muscles not tiring easily during these exercises. Previous research supports this idea, as high-intensity training has been shown to positively affect anaerobic ability (Bravo et al., 2008; McGinley & Bishop, 2016; Stöggl & Björklund, 2017). High-intensity exercise interspersed with short rest periods is an effective training method for improving athletes› metabolic and cardiovascular function (Buchheit & Laursen, 2013; Foster et al., 2015; Kunz et al., 2019). This type of exercise is known as intermittent exercise, which involves alternating short periods of high-intensity activity with low-activity recovery or rest phases (Cavar et al., 2019; Norton et al., 2010; Sloth et al., 2013).

The training model used in the research features a game in which players face an equal number of situations and aim to score quickly. This model is based on the demands of a match, requiring each player to perform a series of intense activities, such as sprinting, changing direction, and accelerating during training. This approach aligns with the findings of (Spyrou et al., 2020). Increasing anaerobic ability can have a positive impact on actions during small-sided games, such as passing and shooting. This is supported by research conducted by Apriantono et al. (2021), who found a strong correlation between anaerobic ability and explosive movements like passing, tackling, heading, and shooting. On the other hand, this training model has the advantage of being suitable for the high-intensity demands of the game. Additionally, each group has the opportunity to participate in 2 versus 2 small-sided games without a goalkeeper, which provides high intensity training while allowing for sufficient rest time through active recovery. Paired passing drills outside the area enable the resting group to stay involved in the drill and maintain their body temperatures. This exercise is an alternative high-intensity activity that can be performed at or near maximum capacity. The training model includes a holistic approach that incorporates elements of technique and tactics into physical training. This approach is based on the recommendations of Kusuma et al. (2024), who concluded that a holistic approach is ideal for training. According to (Engel et al., 2018) improving endurance and anaerobic performance variables can save time for adolescent athletes. However, this research has yet to test the effect of training in terms of tactics or techniques. Therefore, further research is needed to determine the effectiveness of this training in those areas.

Conclusions

According to the research and discussion results, the use of SSG with HIIT methods has a significant impact on the anaerobic endurance of student futsal players. This is characterized by a decrease in fatigue levels.

Conflict of interest

The authors guarantee that no conflicts of interest exist.

References

Barbero-Alvarez, J. C., Soto, V. M., Barbero-Alvarez, V., & Granda-Vera, J. (2008). Match analysis and heart rate of futsal players during competition. *Journal of Sports Sciences*. https://doi.org/10.1080/02640410701287289

Mendes, D., Travassos, B., Carmo, J. M., Cardoso, F., Costa, I., & Sarmento, H. (2022). Talent Identification and Development in Male Futsal: A Systematic Review. *International Journal of Environmental Research and Public Health, 19*(17). https://doi.org/10.3390/ijerph191710648

Ribeiro, J. N., Gonçalves, B., Coutinho, D., Brito, J., Sampaio, J., & Travassos, B. (2020). Activity Profile and Physical Performance of Match Play in Elite Futsal Players. *Frontiers in Psychology,* 11, 1709. https://doi.org/10.3389/fpsyg.2020.01709

Da Cruz, J. P., Messias, L. H. D., Cetein, R. L., Rasteiro, F. M., Gobatto, C. A., & Manchado-Gobatto, F. B. (2020). Anaerobic and Agility Parameters of Salonists in Laboratory and Field Tests. International Journal of Sports Medicine, 41(7), 450–460. https://doi.org/10.1055/a-1088-5429

Naser, N., Ali, A., & Macadam, P. (2017). Physical and physiological demands of futsal. *Journal of Exercise Science and Fitness.* https://doi.org/10.1016/j.jesf.2017.09.001

Ohmuro, T., Iso, Y., Tobita, A., Hirose, S., Ishizaki, S., Sakaue, K., & Yasumatsu, M. (2020). Physical match performance of Japanese top-level futsal players in different categories

and playing positions. *Biology of Sport, 37*(4), 359–365. https://doi.org/10.5114/BIOLSPORT.2020.96322

Caetano, F. G., De Oliveira, M. J., Marche, A. L., Nakamura, F. Y., Cunha, S. A., & Moura, F. A. (2015). Characterization of the sprint and repeated-sprint sequences performed by professional futsal players, according to playing position, during official matches. *Journal of Applied Biomechanics, 31*(6). https://doi.org/10.1123/jab.2014-0159

Narizuka, T., & Yamazaki, Y. (2019). Clustering algorithm for formations in football games. *Scientific Reports, 9*(1), 1–8. https://doi.org/10.1038/s41598-019-48623-1

Milioni, F., Vieira, L. H. P., Barbieri, R. A., Zagatto, A. M., Nordsborg, N. B., Barbieri, F. A., dos-Santos, J. W., Santiago, P. R. P., & Papoti, M. (2016). Futsal match-related fatigue affects running performance and neuromuscular parameters but not finishing kick speed or accuracy. *Frontiers in Physiology, 7*(NOV), 1–10. https://doi.org/10.3389/fphys.2016.00518

Farhani, F., Rajabi, H., Negaresh, R., Ali, A., Shalamzari, S. A., & Baker, J. S. (2019). Reliability and validity of a novel futsal special performance test designed to measure skills and anaerobic performance. *International Journal of Sports Physiology and Performance, 14*(8). https://doi.org/10.1123/ijspp.2018-0850

Ouertatani, Z., Selmi, O., Marsigliante, S., Aydi, B., Hammami, N., & Muscella, A. (2022). Comparison of the Physical, Physiological, and Psychological Responses of the High-Intensity Interval (HIIT) and Small-Sided Games (SSG) Training Programs in Young Elite Soccer Players. *International Journal of Environmental Research and Public Health, 19*(21). https://doi.org/10.3390/ijerph192113807

Barnes, C., Archer, D., Hogg, B., Bush, M., & Bradley, P. (2014). The evolution of physical and technical performance parameters in the Chinese Soccer Super League. *Biology of Sport, 37*(2), 139–145. https://doi.org/10.5114/BIOLSPORT.2020.93039

Hostrup, M., & Bangsbo, J. (2023). Performance Adaptations to Intensified Training in Top-Level Football. *Sports Medicine, 53*(3). https://doi.org/10.1007/s40279-022-01791-z

Rodrigues, V. M., Ramos, G. P., Mendes, T. T., Cabido, C. E. T., Melo, E. S., Condessa, L. A., Coelho, D. B., & Garcia, E. S. (2011). Intensity of official futsal matches. *Journal of Strength and Conditioning Research.* https://doi.org/10.1519/JSC.0b013e3181fb4574

Wiranata, F. A., Kusuma, I. D. M. A. W., Phanpheng, Y., Bulqini, A., & Prianto, D. A. (2023). The Effect of 6 Weeks of Combination of Three Cone Exercise Using Ball and High-Intensity Interval Training on the Agility and Dribbling Ability of Student Futsal Athletes. *Physical Education Theory and Methodology, 23*(5), 686–691. https://doi.org/10.17309/tmfv.2023.5.05

Ziemann, E., Grzywacz, T., Luszczyk, M., Laskowski, R., Olek, R. A., & Gibson, A. L. (2011). Aerobic and anaerobic changes with high-intensity interval training in active college-aged men. *Journal of Strength and Conditioning Research, 25*(4), 1104–1112. https://doi.org/10.1519/JSC.0b013e3181d09ec9

Andrade, V. L., Zagatto, A. M., Kalva-Filho, C. A., Mendes, O. C., Gobatto, C. A., Campos, E. Z., & Papoti, M. (2015). Running-based anaerobic sprint test as a procedure to evaluate anaerobic power. *International Journal of Sports Medicine, 36*(14). https://doi.org/10.1055/s-0035-1555935

Kumar, G., & Pandey, V. (2023). Effect of Complex Training on Aerobic and Anaerobic Power of Amateur Athletes. *Physical Education Theory and Methodology, 23*(1). https://doi.org/10.17309/tmfv.2023.1.09

Mashud, M., Hamid, A., & Abdillah, S. (2019). Pengaruh komponen fisik dominan olahraga futsal terhadap teknik dasar permainan futsal. *Gladi : Jurnal Ilmu Keolahragaan.* https://doi.org/10.21009/gjik.101.04

Yan, S., Kim, Y., & Choi, Y. (2022). Aerobic and Anaerobic Fitness according to High-Intensity Interval Training Frequency in Youth Soccer Players in the Last Stage of Rehabilitation. *International Journal of Environmental Research and Public Health, 19*(23). https://doi.org/10.3390/ijerph192315573

Bravo, D. F., Impellizzeri, F. M., Rampinini, E., Castagna, C., Bishop, D., & Wisloff, U. (2008). Sprint vs. interval training in football. *International Journal of Sports Medicine, 29*(8). https://doi.org/10.1055/s-2007-989371

McGinley, C., & Bishop, D. J. (2016). Influence of training intensity on adaptations in acid/base transport proteins, muscle buffer capacity, and repeated-sprint ability in active men. *Journal of Applied Physiology, 121*(6), 1290–1305. https://doi.org/10.1152/japplphysiol.00630.2016

Stöggl, T. L., & Björklund, G. (2017). High Intensity Interval Training Leads to Greater Improvements in Acute Heart Rate Recovery and Anaerobic Power as High Volume Low Intensity Training. *Frontiers in Physiology,* 8, 562. https://doi.org/10.3389/fphys.2017.00562

Buchheit, M., & Laursen, P. B. (2013). High-intensity interval training, solutions to the programming puzzle: Part II: Anaerobic energy, neuromuscular load and practical applications. *Sports Medicine, 43*(10), 927–954. https://doi.org/10.1007/s40279-013-0066-5

Foster, C., Farl, C. V., Guidotti, F., Harbin, M., Roberts, B., Schuette, J., Tuuri, A., Doberstein, S. T., & Porcari, J. P. (2015). The effects of high intensity interval training vs steady state training on aerobic and anaerobic capacity. *Journal of Sports Science and Medicine, 14*(4), 747–755. https://doi.org/10.1249/01.mss.0000476771.63318.52

Kunz, P., Engel, F. A., Holmberg, H. C., & Sperlich, B. (2019). A Meta-Comparison of the Effects of High-Intensity Interval Training to Those of Small-Sided Games and Other Training Protocols on Parameters Related to the Physiology and Performance of Youth Soccer Players. *Sports Medicine – Open, 5*(1). https://doi.org/10.1186/s40798-019-0180-5

Cavar, M., Marsic, T., Corluka, M., Culjak, Z., Cerkez Zovko, I., Müller, A., Tschakert, G., & Hofmann, P. (2019). Effects of 6 Weeks of Different High-Intensity Interval and Moderate Continuous Training on Aerobic and Anaerobic Performance. *Journal of Strength and Conditioning Research, 33*(1), 44–56. https://doi.org/10.1519/JSC.0000000000002798

Norton, K., Norton, L., & Sadgrove, D. (2010). Position statement on physical activity and exercise intensity terminology. *Journal of Science and Medicine in Sport, 13*(5), 496–502. https://doi.org/10.1016/j.jsams.2009.09.008

Sloth, M., Sloth, D., Overgaard, K., & Dalgas, U. (2013). Effects of sprint interval training on VO2max and aerobic exercise performance: A systematic review and meta-analysis. *Scandinavian Journal of Medicine and Science in Sports, 23*(6), 341–352. https://doi.org/10.1111/sms.12092

Spyrou, K., Freitas, T. T., Marín-Cascales, E., & Alcaraz, P. E. (2020). Physical and Physiological Match-Play Demands and Player Characteristics in Futsal: A Systematic Review. *Frontiers in Psychology,* 11. https://doi.org/10.3389/fpsyg.2020.569897

Apriantono, T., Bahri, S., Indah, S. I., & Bagus, W. (2021). Physiological and competitive characteristics of professional female futsal players. *Physical Education Theory and Methodology, 21*(1). https://doi.org/10.17309/tmfv.2021.1.03

Kusuma, I. D. M. A. W., Kusnanik, N. W., Lumintuarso, R., & Phanpheng, Y. (2024). The Holistic and Partial Approach in Soccer Training: Integrating Physical, Technical, Tactical, and Mental Compo-nents: A Systematic Review. *Retos,* 54, 328–337. https://doi.org/10.47197/retos.v54.102675

Engel, F. A., Ackermann, A., Chtourou, H., & Sperlich, B. (2018). High-intensity interval training performed by young athletes: A systematic review and meta-analysis. *Frontiers in Physiology, 9*. https://doi.org/10.3389/fphys.2018.01012

Підвищення анаеробної витривалості у студентів-футзалістів шляхом поєднання ігор з обмеженою кількістю гравців та високоінтенсивним інтервальним тренуванням

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

Реферат. Стаття: 5 с., 3 табл., 33 джерела.

Мета дослідження. Футзал є командним видом спорту, який потребує застосування анаеробних тактичних прийомів та ігрових технік, деякі з них включають комбінації нападу проти захисту та високоінтенсивні інтервальні тренування (ВІІТ). Метою цього дослідження було визначити вплив застосування тренувальних ігор з невеликою кількістю гравців та високоінтенсивного інтервального тренування на показники анаеробної витривалості футзалістів.

Матеріали та методи. У цьому дослідженні застосовано метод претесту та посттесту для однієї групи. Категорія досліджуваних складалася з 25 гравців. Було відібрано 16 гравців із середнім віком 15,9 ± 0,5 років, зростом 158,1 ± 5,79 см, масою тіла 58,9 ± 9,79 кг та ІМТ 19,9 ± 2,41. Дані дослідження було проаналізовано із застосуванням t-критерію для парних вибірок.

Результати. На підставі результатів t-критерію для парних вибірок було встановлено, що sig (2-tailed) (значимість (2-стороння)) становила 0,002 < 0,005, що свідчить про суттєве збільшення показників анаеробної витривалості.

Висновки. Таким чином, можна зробити висновок, що ігрові тренування з обмеженою кількістю гравців у поєднанні з високоінтенсивним інтервальним тренуванням істотно сприяють покращенню анаеробної витривалості у студентів-футзалістів.

Ключові слова: футзал, ігри з обмеженою кількістю гравців, високоінтенсивне інтервальне тренування, анаеробна витривалість.

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