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The Effectiveness of Small-Sided Games Training Model on Improving Beach Volleyball Tactical Skills

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Abstract

Beach volleyball athletes need tactical skills, especially since the game demands quick decision making, strategic ball placement, and adapting to dynamic situations. However, the most popular training methods are still technical-mechanical and do not consider real game situations. The purpose of this study was to determine how effective the small toy training (SSG) model is in improving the tactical skills of adolescent beach volleyball athletes. A quasi-experimental with a non-comparable control group design was used. 24 athletes were divided into two groups: one for experimental training (SSG) and one for conventional training. The intervention lasted for three weeks, and nine training sessions were conducted during the period. Three experts validated the tactical skills through an analytical observation rubric. Data analysis was performed using Jamovi for paired sample t-test and independent sample t-test. The results showed a significant increase in the experimental group with a large effect size ($p < 0.001$). The results indicate that SSG is effective in improving the tactical skills of young athletes. It also suggests that SSG can be used as an alternative to contextual training and in accordance with the needs of real games.

Keywords: *Beach volleyball, small-sided games, tactical skills, athlete training, youth*

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INTRODUCTION

Beach volleyball has developed into a competitive sport that attracts widespread attention, not only because of its entertainment aspects and unique atmosphere, but also because of the physical and technical challenges it contains. (Giatsis, 2023; Marzano-Felisatti et al., 2025). International competitions such as the World Championships and the Olympics have made beach volleyball a prestigious sport (Vicente et al., 2021). The physical requirements of this sport are very complex. Athletes are required to have high strength, speed, endurance, and coordination skills (Negi et al., 2024). The unstable sand terrain makes every movement biomechanically more difficult (Giatsis et al., 2023). This condition causes athletes to have to expend more energy, regulate the rhythm of the game effectively, and adjust basic

techniques to surfaces that do not support optimal push-off. The complexity of the game does not only lie in the physical challenges (Sansone & Rago, 2024). The limited number of players, two people in one team, makes the strategy and decision-making aspects much more prominent than other team sports (Nagarabetta, 2023). Each athlete must be able to read the game, place the ball effectively, and work together in a system of rotation and quick tactical adjustments (Firmana et al., 2023). Any mistake in reading the wind direction, the speed of the ball, or the opponent's attack pattern can have a direct impact on the score of the match (Wang et al., 2024). Therefore, mastery of tactical skills is one of the key aspects that distinguishes superior athletes from ordinary ones.

Tactical skills in the context of beach volleyball include a number of cognitive abilities and complex technical execution. The ability to make quick decisions, place the ball strategically, and respond to changes in opponent tactics are key indicators of playing intelligence (game intelligence). (Zhang, 2024) emphasizes that tactical skills cannot be developed separately from the context of the match, but must be formed through direct involvement in dynamic and stressful game situations. Athletes who master techniques well are not necessarily able to show optimal performance in real matches if they are not equipped with mature tactical abilities to respond to various situational stimuli (Maier et al., 2024).

The training system in various coaching clubs, especially in the youth age group, still focuses on repeating basic techniques in a mechanical and fragmented manner (Shakhlina et al., 2023). This type of training may improve movement consistency, but it fails to create strategic understanding and adaptive tactical responses (Stiltner et al., 2023). Conventional training methods that lack real game context tend to hinder the development of athletes' tactical intelligence (Kutz, 2022). When entering competition, many teenage athletes have difficulty reading the game, making decisions, and working together in rapidly changing situations (Silva & Conte, 2020). As an alternative, game-based training approaches such as small-sided games (SSG) have emerged as an innovative strategy that better suits the fast-paced, high-pressure characteristics of beach volleyball (Khurrohman et al., 2021). SSG uses a small-scale training format that simulates match conditions in a more contextual way, with an emphasis on interaction, quick decision-making and strategy adaptation (Yeung et al., 2024) reported that the application of SSG in soccer and basketball has been shown to be effective in improving tactical understanding, spatial awareness, and response to game dynamics. This concept allows athletes to learn implicitly, forming playing intelligence through direct experience in modified small-sided games.

Research on the effectiveness of the small-sided games training model in the context of beach volleyball is still very limited, especially in the population of adolescent athletes who are in a critical phase of tactical skill formation. This limited literature leaves an important gap in the development of training methods based on empirical evidence. In fact, adolescents as an age group who are developing cognitively and motorically have great potential to receive a contextual and meaningful training approach. Therefore, this study was conducted to evaluate the effect of the small-sided games training model on improving the tactical skills of adolescent beach volleyball athletes. This study is expected to enrich the literature on beach sports coaching and provide practical implications for coaches in designing training programs that are in accordance with the demands of real games.

METHOD

This study uses a quantitative approach with a quasi-experimental design, specifically a non-equivalent control group design. This design involves two groups, each receiving different treatments. The experimental group was given treatment in the form of a small-sided games training model, while the control group followed a conventional technique and tactics training program as implemented by the coaches at each club. To determine the effectiveness of the treatment, measurements were taken before and after the intervention through a pre-test and post-test, which were designed to evaluate changes in tactical skills objectively.

The population in this study were teenage beach volleyball athletes who actively participated in the coaching program at the Surabaya volleyball club. The sampling technique used was purposive sampling, with the following inclusion criteria: (1) aged between 14 and 18 years, (2) actively training regularly for at least the last six months, and (3) in good health and not injured during the study period. Based on these criteria, 24 athletes were obtained who were then divided into two balanced groups, each consisting of 12 people, based on their pre-test results in order to ensure the comparability of initial skill levels between the experimental and control groups.

Before the intervention began, all participants underwent a pre-test to measure their initial tactical skills. Over the next three weeks, the experimental group participated in small-sided games training sessions three times a week, for a total of nine meetings, and a duration of 90 minutes per session. The training formats used varied between 2v2 (2v2) and 3v3 (3v3) games, with game scenario modifications such as time pressure, player role rotation, and playing area restrictions to increase tactical complexity. Meanwhile, the control group continued to carry out the conventional technical and tactical training program as usual. After

all intervention sessions were completed, all participants underwent a post-test again to determine changes in their respective tactical performance.

The instrument used in data collection was an analytical observation rubric that measured three indicators of tactical skills, namely decision making, ball placement, and adaptation to opponent strategies. The assessment was carried out based on video recordings of simulation games and analyzed by three appointed coaching experts. The validity of the instrument content was confirmed through expert panel discussions, while inter-rater reliability was tested using the inter-rater reliability method, with the test results showing an intraclass correlation coefficient (ICC) value> 0.85, indicating high assessment consistency. The validity method followed the principles of the Content Validity Index (Roy & Sahu, 2024). while the reliability analysis referred to the Intraclass Correlation Coefficient approach as suggested by (Douglas et al., 2023).

Data analysis was conducted descriptively to determine the average and standard deviation, and inferentially to test the significance of the differences between before and after the intervention. The paired sample t-test was used to see changes in each group (pre-test vs post-test), while the independent sample t-test was used to compare the results between the experimental group and the control group, both in the pre-test, post-test, and gain scores. Before conducting the hypothesis test, a prerequisite test was conducted in the form of a normality test using the Kolmogorov-Smirnov method and a homogeneity of variance test using Levene's Test. The entire analysis process was carried out using Jamovi software, with a significance level set at $\alpha = 0.05$.

RESULTS AND DISCUSSION

Result

This section presents the results of data analysis from the measurement of beach volleyball athletes' tactical skills before and after the intervention. This analysis was conducted descriptively and inferentially to determine how the small game training model impacts the improvement of tactical skills. To ensure the feasibility of the statistical tests used, normality and homogeneity tests were also conducted.

The purpose of descriptive analysis is to provide an initial picture of the condition of athletes' tactical skills before and after treatment in the experimental and control groups. This information includes the number of subjects, mean values, standard deviations, and minimum

and maximum values. These values can help show the trend of changes that occur after treatment.

Table 1. Descriptive Statistics of Pre-test and Post-test Scores

Descriptives			
	Group	**PRETEST**	**POSTTEST**
N	1 Eksperimen	12	12
	2 Kontrol	12	12
Missing	1 Eksperimen	0	0
	2 Kontrol	0	0
Mean	1 Eksperimen	13.5	20.3
	2 Kontrol	13.8	14.9
Median	1 Eksperimen	13.5	20.5
	2 Kontrol	14.0	15.0
Standard deviation	1 Eksperimen	1.00	1.36
	2 Kontrol	0.754	0.669
Minimum	1 Eksperimen	12	18
	2 Kontrol	13	14
Maximum	1 Eksperimen	15	22
	2 Kontrol	15	16

Table 1 shows that both groups were in equal initial conditions, with the average pre-test score between the experimental group (13.5) and the control group (13.8). The average score of the experimental group increased sharply to 20.3 after treatment, while the average score of the control group only increased slightly to 14.9. This shows that the improvement of tactical skills is positively influenced by the intervention in the form of small games.

Before conducting a parametric test to test the hypothesis, it is necessary to ensure that the data is normally distributed. The normality test is conducted using the Shapiro–Wilk method which is considered appropriate for small to medium sample sizes. Normal data distribution is an important requirement so that the results of parametric tests such as the t-test provide valid results and can be interpreted correctly.

Tabel 2. Uji Normalitas (Shapiro–Wilk)

Normality Test (Shapiro-Wilk)		
	W	**p**
PRETEST	0.933	0.115
POSTTEST	0.942	0.179
Note. A low p-value suggests a violation of the assumption of normality		

The results of the normality test in Table 2 show that all data have a significance value greater than 0.05, so it can be concluded that the data in the pre-test and post-test meet the normality assumption. Thus, the data is worthy of being analyzed using parametric statistical tests such as the t-test.

The homogeneity of variance test, in addition to the normality test, is needed to determine whether the distribution of data in both groups has the same variance. Levene's test is used because it can find inequality of variance even though the data distribution is not perfect. To determine the type of t-test to be used, this assumption of homogeneity of variance is very important.

Tabel 3. Uji Homogenitas Varians (Levene's Test)

Homogeneity of Variances Test (Levene's)				
	F	**df**	**df2**	**p**
PRETEST	1.35	1	22	0.257
POSTTEST	6.02	1	22	0.023
Note. A low p-value suggests a violation of the assumption of equal variances				

According to Table 3, the variance of the pre-test data is homogeneous (p = 0.257), indicating that the t-test analysis can use the assumption of equal variance. However, the variance of the post-test data is not homogeneous (p = 0.023), indicating that the t-test method should be adjusted to the different variances. An independent t-test was conducted to determine whether there was a significant difference between the experimental and control groups in the pre-test and post-test scores. This test is important to ensure initial equality before treatment and to identify the effect of the intervention after treatment is given.

Tabel 4. Uji-t Independen

Independent Samples T-Test					
		Statistic		**df**	**p**
PRETEST	Student's t	-0.692		22.0	0.496
POSTTEST	Student's t	12.214	[a]	22.0	< .001
Note. H_a $\mu_{1\ EKSPERIMEN} \neq \mu_{2\ KONTROL}$					
[a] Levene's test is significant (p < .05), suggesting a violation of the assumption of equal variances					

The test results in Table 4 show that the pre-test scores between the two groups did not show a significant difference (p = 0.496), indicating that the initial skills of the participants in both groups were in comparable conditions. Meanwhile, the post-test scores showed a significant difference (p = 0.001) between the experimental and control groups, indicating that training with small games was significantly more effective in improving mening. The paired t-test, also known as the paired t-test, was used to complete the analysis by determining the level of improvement that occurred in both groups (experimental and control). This analysis shows the effectiveness of the treatment in terms of changes in scores.

Tabel 5. Paired t-test

Paired Samples T-Test									
			statistic	**df**	**p**	**Mean difference**	**SE difference**		**Effect Size**
PRETEST	POSTTEST	Student's t	-6.73	23.0	< .001	-3.96	0.588	Cohen's d	-1.37
Note. H_a $\mu_{\text{Measure 1 - Measure 2}} \neq 0$									

All results showed a significant increase from pre-test to post-test ($p < 0.001$). The changes were considered large, according to the effect size value of 1.37. These results support the idea that the intervention can improve athletes' tactical skills.

Discussion

This study found that the small-sided game (SSG) model improves the tactical skills of adolescent beach volleyball athletes (Gofron et al., 2023). These improvements show that SSG is very effective in making learning experiences more contextual, moving, and relevant to real match situations (Uddin et al., 2020). These results support the idea that, in the context of sport training, a game-based approach can help integrate affective, cognitive and technical elements into training activities (Huber et al., 2024).

SSG offers a complexity that is more similar to real game situations. This is in contrast to conventional training approaches, which are usually repetitive and detached from the game context. Athletes not only have to use certain techniques, but they also have to make quick decisions, adjust strategies and adapt to high pressure (Xu & Wang, 2024). This is in line with (Zhang, 2024) who says that improving tactical skills can only be achieved through direct involvement in game situations that require strategic thinking and quick action.

The SSG training in this study was designed with a small-scale game format such as 2v2 and 3v3 accompanied by various modified scenarios, such as time restrictions, role rotation, and narrow playing areas. These variations indirectly increase tactical demands, forcing athletes to read situations, communicate with teammates, and formulate tactical solutions in a short time (Plakias et al., 2024). This supports the findings (Barbosa et al., 2020) that situational modifications in small-sided games can stimulate deeper processing of tactical information. Practically, coaches who use the SSG approach provide athletes with the opportunity to learn through experience also known as experiential learning which is more effective than verbal instruction alone (Salimon, 2022). Because the training conditions are less cognitively challenging, responses to match stress are typically not elicited during conventional

training, which is in line with the criticism raised by (Loock & Schwabe, 2024) towards the technical-mechanical approach, which is considered ineffective in developing overall playing intelligence.

This study also strengthens the argument that adolescence is a sensitive period in the formation of tactical skills (Schalbetter et al., 2022). Athletes in this age range are in a stage of cognitive development that allows them to begin to think logically, understand patterns, and make strategic decisions (Feraco & Meneghetti, 2022). Therefore, the presentation of training stimuli that are appropriate to their thinking capacity is crucial. SSG, with its adjustable complexity, allows coaches to provide progressive and meaningful challenges according to the athlete's developmental stage (Gomez Ruano, 2024). In addition, the findings of this study add to the limited literature on the application of SSG in beach volleyball. So far, there has been much discussion about the effectiveness of SSG in soccer and basketball (Cao et al., 2024; Neag et al., 2024), but there has been little research on its application in a sand environment with a limited number of players. As a result, these findings improve beach sports training methods, especially those related to tactics.

The results are quite clear from a coaching perspective. It is recommended that coaches incorporate mini-games into their training on a regular basis. This should be done as an integral part of tactical learning, not as an add-on. Observation rubrics that measure decision-making, ball placement, and adaptation to opponent strategies have also been shown to be effective in assessing overall tactical skill development. Overall, this study suggests that a training model centered on real-game contexts is more effective in improving tactical skills than conventional fragmented methods. This is in line with contemporary coaching paradigms that emphasize the importance of learning transfer from training to real-game situations. Therefore, future training programs should focus more on an adaptive, reflective, and hands-on approach to the athlete's experience on the field.

CONCLUSION

Based on the results of the analysis and discussion, it can be concluded that the small game training model has been proven effective in improving the tactical skills of young beach volleyball athletes. Small game-based training is more effective than conventional training, especially in terms of decision making, ball placement, and adaptation to opponent strategies. Directly, this approach improves the playing intelligence and tactical responses of athletes. The effectiveness of this intervention shows the importance of using training methods that emphasize the integration of technical, cognitive, and affective elements in a training context

that is similar to a real game situation. These findings have practical consequences for coaches, especially when they create youth athlete development programs that focus on basic technical skills and readiness to think tactically in a competitive context.

REFERENCES

Barbosa, G. F., Emilio, P., Moreira, D., Chagas, M. H., Greco, P. J., & Memmert, D. (2020). Changes in tactical behavior during small-sided and conditioned games performed within a training session. *Scielo Brazil: Rev Bras Cineantropom Hum*, 1–11. https://doi.org/10.1590/1980-0037.2020v22e71126

Cao, J., Eakronnarongchai, W., & Duangkam, J. (2024). Small-Sided Games with Baskets Are Significantly More Effective at Enhancing Neuromuscular Force Parameters Compared to Ball Possession Games : A Randomized Controlled Study in Young Male Basketball Players. *Journal of Sports Science and Medicine*, *23*, 638–646. https://doi.org/10.52082/jssm.2024.638

Douglas, F., Barbosa, S., Dos, L., Emilia, M., Alves, D., Á, J. De, Alves, B., Cristina, T., Cerqueira, F., Joviniano, V., & Filho, D. S. (2023). Inter-Examiner and Intra-Examiner Reliability of Quantitative and Qualitative Ultrasonography Assessment of Peripheral and Respiratory Muscles in Critically Ill Patients. *International Journal of Environmental Research and Public Health*, *20*(5636), 1–12.

Feraco, T., & Meneghetti, C. (2022). Sport Practice , Fluid Reasoning , and Soft Skills in 10- to 18-Year-Olds. *Frontiers in Human Neuroscience*, *16*(March), 1–8. https://doi.org/10.3389/fnhum.2022.857412

Firmana, I., Subarjah, H., & Mahendra, A. (2023). Improving football playing skills through teaching games for understanding : A small-sided games approach. *Journal Sport Area*, *8*(2), 184–193. https://doi.org/10.25299/sportarea.2023.vol8(2).12508 Copyright

Giatsis, G. (2023). Beach volleyball performance benchmarks in men ' s high level. *Journal of Human Sport & Exercise*, *18*(2), 446–461. https://doi.org/10.14198/jhse.2023.182.15

Giatsis, G., Panoutsakopoulos, V., Frese, C., & Kollias, I. A. (2023). Vertical Jump Kinetic Parameters on Sand and Rigid Surfaces in Young Female Volleyball Players with a Combined Background in Indoor and Beach Volleyball. *Journal of Functional Morphology and Kinesiology*, *8*(115), 1–15. https://doi.org/10.3390/jfmk8030115

Gofron, M., Basri, M. H., & Rasyid, A. (2023). Faktor Pendukung Keberhasilan Bola Voli Pantai Porprov Kabupaten Pamekasan Dalam Kejuaraan Porprov Jatim VII 2022. *SPRINTER: Jurnal Ilmu Olahraga*, *4*(3), 272–279. https://doi.org/10.46838/spr.v4i3.389

Gomez Ruano, M.-A. (2024). Grand challenges : Unlocking peak potential , empowering athletes and coaches to reach their optimal level. *Frontiers in Psychology*, *15*, 1–3. https://doi.org/10.3389/fpsyg.2024.1388427

Huber, S. E., Edlinger, M., Lindstedt, A., Kiili, K., & Ninaus, M. (2024). Game elements improve affect and motivation in a learning task. *International Journal of Serious Games*, *11*(4), 103–125. https://doi.org/10.17083/ijsg.v11i4.769

Khurrohman, M. F., Yudanto, Marhaendro, A. S. D., Festiawan, R., & Hidayat, R. (2021). Small-sided games: alternative exercise to improve cognitive performance of youth futsal players. *Jurnal SPORTIF: Jurnal Penelitian Pembelajaran*, *7*(1), 37–50. https://doi.org/10.29407/js_unpgri.v7i1.15667

Kutz, M. R. (2022). The Need for Contextual Intelligence in Athletic Training. *International Journal of Athletic Therapy and Training*, *27*, 261–265. https://doi.org/10.1123/ijatt.2022-0102 ©

Loock, K., & Schwabe, L. (2024). Archival Report Cognitive Training Prevents Stress-Induced

Working Memory De fi cits. *Biological Psychiatry: Cognitive Neuroscience and Neuroimaging*, *9*(10), 1039–1047. https://doi.org/10.1016/j.bpsc.2024.06.006

Maier, T., Alzahabi, R., Sharpe, B. T., & Maier, H. (2024). The React – Predict – Manipulate Model : A Proposed Theoretical Hierarchy of Decision Making in Competitive Environments RPM Model : Theoretical Framework. *Journal of Electronic Gaming and Esports*, *2*, 1–7. https://doi.org/10.1123/jege.2024-0014

Marzano-Felisatti, J. M., Pino-Ortega, J., Priego-Quesada, J. I., Guzmán-Luján, J. F., & García-de-Alcaraz, A. (2025). Physical performance and game demands in beach volleyball : A systematic review. *Journal of Human Sport & Exercise*, *20*(1), 79–92. https://doi.org/10.55860/g1z4az52

Nagarabetta, S. (2023). Study of decision making of team and individual sports players. *International Journal of Physiology, Sports and Physical Education*, *5*(2), 1–4. https://doi.org/10.33545/26647710.2023.v5.i2a.46

Neag, I., Mihaila, I., Fleancu, L. J., Acsinte, A., Popescu, C. D., Stancu, M., Potop, V., Trandafirescu, G., & Mihai, I. (2024). Effectiveness of small-sided games on change of direction speed in youth soccer players : a systematic review and meta-analysis. *Human Movement*, *25*(4), 53–67. https://doi.org/10.5114/hm/195914

Negi, G., Sharma, L., Singh, M., & Goel, K. (2024). The role of gender and training age in shaping physical characteristics of volleyball players : A comparative analysis. *Scientific Journal of Sport and Performance*, *3*(3), 333–350. https://doi.org/10.55860/NJQT6791

Plakias, S., Tsatalas, T., Armatas, V., & Tsaopoulos, D. (2024). Tactical Situations and Playing Styles as Key Performance Indicators in Soccer. *Journal of Functional Morphology and Kinesiology*, *9*(88), 1–13. https://doi.org/10.3390/jfmk9020088

Roy, P., & Sahu, K. K. (2024). Building a roadmap for content validation : 6C model and validity index. *International Journal of Research in Management*, *6*(1), 110–114. https://doi.org/10.33545/26648792.2024.v6.i1b.130 Abstract

Salimon, F. (2022). Experiential Learning. *International Journal of Research Publication and Reviews*, *3*(12), 2363–2366. https://doi.org/10.55248/gengpi.2022.31276

Sansone, P., & Rago, V. (2024). Editorial : Multidisciplinary perspectives on team sports : contextualizing training and competition demands. *Frontiers in Psychology*, *15*, 1–2. https://doi.org/10.3389/fpsyg.2024.1505156

Schalbetter, S. M., Arx, A. S. Von, Cruz-ochoa, N., Dawson, K., Ivanov, A., Mueller, F. S., Lin, H., Amport, R., Mildenberger, W., Mattei, D., Beule, D., Földy, C., Greter, M., Notter, T., & Meyer, U. (2022). Adolescence is a sensitive period for prefrontal microglia to act on cognitive development. *Science Advances*, *8*(9), 1–19.

Shakhlina, L., Futornyi, S., Socha, T., & Maslova, O. (2023). Medical and biological fundamentals of young athletes ' training. *Slobozhanskyi Herald Of Science And Sport*, *27*(4), 185–192. https://doi.org/10.15391/snsv.2023-4.003

Silva, A. F., & Conte, D. (2020). Decision-Making in Youth Team-Sports Players : A Systematic Review. *International Journal of Environmental Research and Public Health Review*, *17*(3803), 1–23. https://doi.org/10.3390/ijerph17113803

Stiltner, S., Thompson, A. J., & Cripps, A. (2023). Journal of Sports Medicine and Allied Health Sciences : Official Journal of the Ohio Athletic Trainers Association Efficacy of Corrective Exercise on Improving Functional Movement within the Tactical Population : A Critically Appraised Topic. *Journal of Sports Medicine and Allied Health Sciences: Official Journal of the Ohio Athletic Trainers Association*, *9*(1), 6–9.

Uddin, Z. S., Setijono, H., & Wiriawan, O. (2020). Evaluasi Pembelajaran Dan Latihan Siswa Smanor Sidoarjo Pada Prestasi Nasional (Studi Pada Atlet Putra Bola Voli Pantai SMANOR Sidoarjo). *Jurnal Ilmiah Mandala Education*, *6*(2), 488–498. http://ejournal.mandalanursa.org/index.php/JIME/index

Vicente, P., Medeiros, A., Ortig, H., Lee, M., & Mota, M. P. (2021). applied sciences Global Position Analysis during Official Elite Female Beach Volleyball Competition : A Pilot Study. *Applied Sciences*, *11*(9382), 1–9. https://doi.org/10.3390/app11209382

Wang, Y., Zhang, C., Yiming, G., & Yu, Y. (2024). Research on match fluctuation prediction and strategy based on OFS algorithm. *Highlights in Science, Engineering and Technology*, *115*, 9–14. https://doi.org/10.54097/festp782

Xu, C., & Wang, Y. (2024). Tactical Intelligent Decision Modelling in Sports Competitions Based on Reinforcement Learning Algorithms. *Journal of Electrical System*, *20*(6), 2092–2101. https://doi.org/10.52783/jes.3124

Yeung, C., Bunker, R., & Fujii, K. (2024). Unveiling Multi-Agent Strategies : A Data-Driven Approach for Extracting and Evaluating Team Tactics from Football Event and Freeze-Frame Data. *Journal of Robotics and Mechatronics*, *36*(3), 603–617. https://doi.org/10.20965/jrm.2024.p0603

Zhang, F. (2024). Study on the Application of Tactical Consciousness in Basketball Sports Training. *Scientific and Social Research*, *6*(10), 41–45. https://doi.org/10.26689/ssr.v6i10.8523