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The Effect of Integrated Ball Training on Improving the Physical Condition of Futsal Athletes at Skensa Futsal Academy

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Abstrac: Physiological conditions are crucial for supporting the performance of futsal athletes who require speed, agility, and endurance. This study aims to determine the effect of integrated ball training on the physical condition of futsal athletes at the Skensa Futsal Academy. The method used was an experiment with a pretest-posttest control group design, involving 30 athletes through total sampling. The training program lasted for six weeks with three sessions per week. Measurements were carried out using the 50-meter run test, the Illinois Agility Run, and the 2400-meter run. Data analysis used the Shapiro–Wilk test, homogeneity test, and paired t-test in SPSS 26. The results showed a significant increase in the experimental group ($p < 0.05$), indicated by a decrease in time across all tests. The study's results demonstrated the superiority of integrated ball training over traditional methods, as it combines physical and skill components simultaneously.

Keyword: Athlete, Futsal, Integrated Ball Training, Physical Condition.

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INTRODUCTION

Sport is a physical activity that plays a vital role in human life, contributing to health, fitness, and achievement (Cahulul, 2024). Through regular exercise, a person can improve their physical abilities, enabling them to perform daily activities without excessive fatigue (Hasan et al., 2025). In competitive sports, physical fitness is a key factor in determining an athlete's ability to achieve optimal performance (Zhang, 2023; Biliandri et al., 2018). Therefore, physical fitness development must be carried out systematically, planned, and continuously so that athletes can develop their full potential.

Physical fitness is the primary foundation that supports all aspects of an athlete's performance (Supriady, 2021). Good physical fitness will influence an athlete's ability to master techniques, implement tactics, and maintain mental stability during a match. The components of physical fitness include endurance, strength, speed, agility, coordination, balance, and flexibility (Weda, 2021). Each sport has different physical component requirements, depending on the characteristics of the game (Cahyo et al., 2024). Therefore, the training program provided to athletes must be tailored to the physical demands of that sport.

One sport that demands good physical condition is futsal. Futsal is a game played by two teams of five players on the field (Rohman et al., 2021). The game is played on a relatively small field with a fast tempo, requiring players to move quickly, agilely, and effectively in a limited space. These conditions make futsal a highly dynamic sport and require a high level of physical fitness from its players (Fallo et al., 2024). The fast-paced, intense nature of futsal requires players to perform various physical activities repeatedly over a relatively short period. Players are required to sprint, change direction, accelerate, and perform offensive and defensive movements continuously throughout the match. This situation makes physical condition components such as endurance, speed, and agility crucial factors in supporting player performance on the field (Sekulic et al., 2021). Without good physical condition, players will struggle to maintain their intensity until the end of the match (Supriadi et al., 2023).

Futsal, in addition to physical fitness, also requires mastery of basic techniques, namely passing, dribbling, shooting, and ball control (Nafida et al., 2024). These techniques must be applied promptly and accurately across a variety of dynamically evolving game scenarios. You can only go so far with good technical skills alone. Technical accuracy tends to decline as players get tired, which can affect play at the group level. To enhance futsal player performance, coaches must complement technical development with greater emphasis on players' core physical capabilities as a basis for training. Doing this means that the training aids physical skills and is situationally applicable in play. This is closely followed by the need for a well-structured training program that enables players to meet their physical demands and sustain performance throughout a match. A widely adopted method across sports development is integrated ball training. This practice integrates aspects of physical and technical training into a single workout (Ilham et al., 2025), enabling players to enhance their capacity and also to react with the ball in an environment similar to true verticals.

Integrated ball training as a beneficial methodology because players can work on the physical mechanisms of ball movement and then transfer that into proper technical actions. Also, training with a ball is often less frustrating for players and leads to increased desire and excitement to participate in the program. All of this provides players with a higher intensity while preventing monotony, something that conventional training without the ball cannot. However, in practice, some futsal teams had not yet fully adopted this training method. Due to the separation of physical and technical training in some programs, players become less accustomed to integrating both components during play (Putra et al., 2023). In matches that require both physical and technical elements, this can lead to suboptimal player performance.

The novelty of this study lies in the application of an integrated ball-training method, specifically designed as drill variations to simultaneously improve the physical condition of futsal athletes in a single training session. Unlike previous studies, which generally separate physical and technical training or emphasize only one component (Lalu et al., 2025; Abrianti et al., 2025; Muhammad et al., 2025). This study integrates both in a controlled experimental design with a quantitative approach based on T-scores as an indicator of physical condition.

Based on observations of the Skensa FA futsal team, several issues related to players' physical condition remain, particularly endurance, speed, and agility. At the start of the match, the players were still able to keep up with their opponents. However, as the match entered the second half, several players began to show signs of fatigue, which affected the team's concentration and quality of play. This was evident in increased passing errors, suboptimal finishing, and decreased intensity of player movement on the field. These conditions indicate that improving the players' physical condition still requires attention in the team's training program. Based on these issues, this study was conducted to determine the effect of integrated ball training on improving the physical condition of Skensa FA futsal athletes. The results of this study are expected to contribute to the development of more effective training methods to improve the physical condition and performance of futsal players.

METHOD

Research Design

This study employed an experimental method with a Pretest-Posttest Control Group Design, a research design involving two groups of subjects: one receiving the treatment and one without, with measurements taken before and after the treatment to determine any changes resulting from the treatment.

Participants

The study was conducted at the Skensa FA Futsal Field and the Annas Futsal Field. The population in this study was all 30 futsal players on the Skensa FA team. The sampling technique used was total sampling, so that all members of the population were included in the study sample. The independent variable in this study was integrated ball training, while the dependent variable was the physical condition of the futsal players.

Instrumens

Instruments using physical fitness testing and measurement techniques covering three main components: speed, agility, and endurance. Speed was measured using a 50-meter sprint test, agility using the Illinois Agility Run, and endurance using a 2400-meter sprint test.

Research Proxedures

Data collection was carried out in two stages: a pretest before the treatment and a posttest after the treatment. Raw scores for each physical fitness component were converted into T-scores using a predetermined formula to standardize athlete performance across all tests. The T-scores were then summed and averaged to determine each athlete's overall physical condition. Based on the final scores, participants were classified into five ability categories: Very High, High, Moderate, Low, and Very Poor. This classification was determined using the assessment norms presented in Table 1 below:

Table 1. Assessment Norms

Interval Class	Category
X ≥ M+1,5 SD	Very High
M+0,5 SD ≤ X < M+1,5 SD	High
M-0,5 SD ≤ X < M+0,5 SD	Medium
M-1,5 SD ≤ X < M-0,5 SD	Less
X ≥ M-1,5 SD	Very Poor

The treatment provided consisted of an integrated ball training program implemented for 6 weeks, with a training frequency of three times per week. The training included several drill variations, such as dynamic triangle drills, Y-shape drills, slalom passes, square box drills, deep overlap, and double wall passes.

Data Analysis

The data obtained were analyzed in SPSS using the Shapiro–Wilk normality test, the homogeneity test, and the paired-samples t-test to determine differences in physical condition before and after the training treatment.

RESULT

The characteristics of the research subjects include age and body mass index, which are explained in the following discussion.

Table 2. Characteristics of Research Subjects

Group	Characteristics	F	Frequency
Age	16	6	20%
	17	17	56,7%
	18	7	23,3%
Body Mass Index	Less	9	30%
	Normal	14	46,7%
	Overweight	6	20%
	Obesity	1	3,3%

Based on Table 2, the characteristics of the research subjects seen from age and body mass index (BMI) show that the majority of respondents were 17 years old (56.7%), followed by 7 people aged 18 years (23.3%), and 6 people aged 16 years (20%). Meanwhile, based on BMI, the majority of respondents were in the normal category, namely 14 people (46.7%), followed by the underweight category (9 people) (30%), the overweight category (6 people) (20%), and the obesity category (1 person) (3.3%).

Table 3. Test Item Measurement Results

		Item	Min	Max	Mean ± Stdev
Control Group	Pretest	Sprint 50m*	7,35	11,4	9,76 ± 1,09
		Illinois Agility Run*	18,3	19,6	19,04 ± 0,41
		Running Test 2400 meter**	15,3	19,85	18,22 ± 1,67
	Postest	Sprint 50m*	6,01	7,17	6,57 ± 0,40
		Illinois Agility Run*	14,8	16,22	15,71 ± 0,46
		Running Test 2400 meter**	9,02	9,5	9,25 ± 0,12
Experimental Group	Pretest	Sprint 50m*	8,75	11,6	9,59 ± 1,81
		Illinois Agility Run*	18,25	19,85	18,44 ± 3,33
		Running Test 2400 meter**	16,7	19,99	17,93 ± 3,26
	Postest	Sprint 50m*	5,1	6,4	5,96 ± 1,19
		Illinois Agility Run*	13,2	15,15	14,41 ± 2,73
		Running Test 2400 meter**	7,01	8,4	8,29 ± 1,69

*Note: *= taken in second || ** = taken in minutes*

Based on Table 3, the test item measurements in the control and experimental groups show changes in pretest-to-posttest scores across variables. In the control group, the average score for the 50-meter sprint decreased from 9.76 ± 1.09 to 6.57 ± 0.40, the Illinois Agility Run from 19.04 ± 0.41 to 15.71 ± 0.46, and the 2400-meter run from 18.22 ± 1.67 to 9.25 ± 0.12. Meanwhile, in the experimental group, there was also a greater decrease in average values, namely the 50-meter sprint from 9.59 ± 1.81 to 5.96 ± 1.19, the Illinois Agility Run from 18.44 ± 3.33 to 14.41 ± 2.73, and the 2400-meter run test from 17.93 ± 3.26 to 8.29 ± 1.69. The decrease in time on all test items was associated with increased physical performance in both the control and experimental groups. However, the increase in the experimental group appeared more optimal than in the control group.

Table 4. Results of the Physical Condition of the Control Group

	Category	Value	F	Frequency
Pretest	Very High	≥155,95	0	0%
	High	151,98-155,95	6	40%
	Medium	148,02-151,97	5	33,4%
	Less	144,05-148,01	2	13,3%
	Very less	≤144,05	2	13,3%
Postest	Very High	≥160,56	1	6,7%
	High	153,52-160,55	3	20%

	Medium	146,48-153,51	8	53,3%
	Less	139,44-146,43	2	13,3%
	Very less	≤139,43	1	6,7%

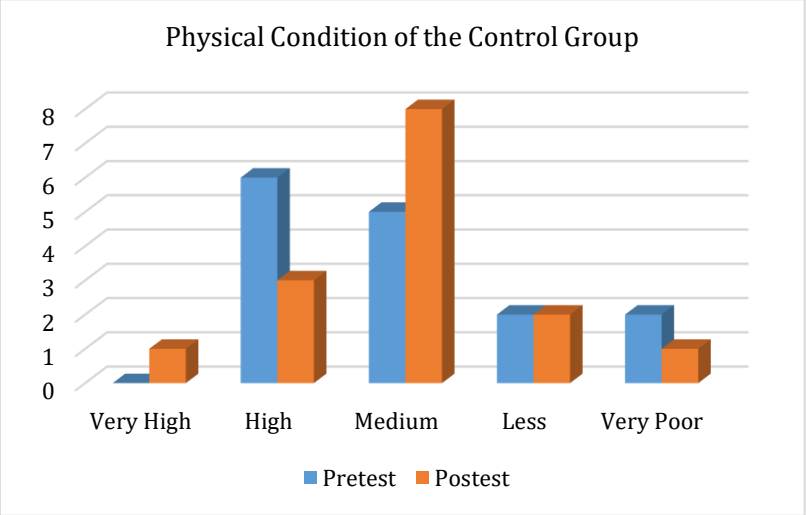

Figure 1. Physical Condition Graph of Control Group

Based on Table 4, the physical condition of the control group during the pretest shows that the majority of respondents were in the high category (6 people (40%) and the moderate category (5 people (33.4%), while the rest were in the poor and very poor categories (2 people (13.3%) each). There were no respondents in the very high category. After the posttest, there was a change in distribution where there was 1 person (6.7%) in the very high category, 3 people (20%) in the high category, and the majority were in the moderate category (8 people (53.3%). In comparison, the poor and very poor categories were 2 people (13.3%) and 1 person (6.7%), respectively. In general, these results indicate an improvement in physical condition in the control group, although the increase was not very significant and remained predominantly in the moderate category.

Table 5. Results of the Physical Condition of the Eksperimental Group

	Kategori	Value	F	Frequency
Pretest	Very High	≥150,18	0	0%
	High	145,92-150,17	4	26,7%
	Medium	141,67-145,91	8	53,3%
	Less	137,41-141,66	1	6,7%
	Very less	≤137,41	2	13,3%
Postest	Very High	≥164,09	3	20%
	High	159,35-164,08	1	6,7%
	Medium	154,61-159,34	5	33,3%
	Less	149,87-154,60	6	40%
	Very less	≤149,87	0	0%

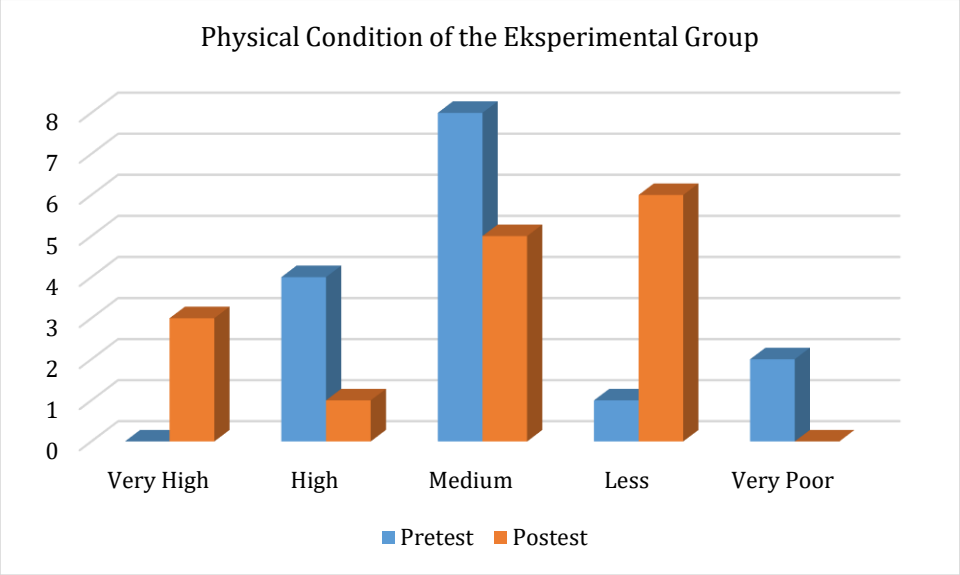

Figure 2. Physical Condition Graph of Experimental Group

Based on Table 5, the physical condition of the experimental group during the pretest was dominated by the moderate category with 8 people (53.3%), followed by the high category with 4 people (26.7%), the very poor category with 2 people (13.3%), and the poor category with 1 person (6.7%), and there were no respondents in the very high category. After the posttest, there was a significant change in distribution, where the very high category increased to 3 people (20%) and the high category with 1 person (6.7%), while the moderate category became 5 people (33.3%) and the poor category increased to 6 people (40%), and there were no more respondents in the very poor category. In general, these results indicate an improvement in physical condition in the experimental group.

Table 6. Normality Test

Variable	Statistic	df	Sig.
Pretest Control	0.961	15	0.718
Postest Control	0.973	15	0.906
Pretest Eksperimental	0.941	15	0.400
Postest Eksperimental	0.888	15	0.063

Based on the results of the normality test, all variables have significance values (Sig.) greater than 0.05: the control pretest (0.718), the control posttest (0.906), the experimental pretest (0.400), and the experimental posttest (0.063). This indicates that the data in both groups, both before and after treatment, are normally distributed.

Tabel 7. Test of Homogeneity

Test of Homogeneity of Variance		Levene Statistic	df1	df2	Sig.
Results of the Physical Condition of Skensa FA	Based on Mean	0.919	1	28	0.346

The results of the homogeneity test using Levene's test showed a significance value (Sig.) of 0.346, which is greater than 0.05. This means that the data variance between the control and experimental groups is homogeneous, i.e., the same.

Table 8. Paired Sample T-Test

Variable	Mean	Std. Deviation	Std. Error Mean	df	Sig.
Control	-9.000	6.80675	1.75749	14	0.960
Eksperimen	-16.20455	6.16333	1.59136	14	0.000

Based on Table 8, the results of the paired sample t-test show that in the control group, the mean value was -9.000 with a significance value (Sig.) of 0.960 (> 0.05), so it can be concluded that there is no significant difference between the pretest and posttest scores in the control group. Meanwhile, in the experimental group, the mean was -16.20455, with a significance value (Sig.) of 0.000 (< 0.05), indicating a significant difference between the pretest and posttest scores. A negative mean value indicates that results improved after treatment (the posttest was better than the pretest). Thus, it can be concluded that the treatment given to the experimental group was effective in improving physical condition, while the control group did not show a significant increase.

DISCUSSION

The findings of this study showed that integrated ball training has a positive effect on the physical condition of futsal athletes, particularly speed, agility, and endurance. This was indicated by a paired-samples t-test within the experimental group, where p = 0.000 (<0.05), but no changes were evident in the control group. The findings suggest that a technical–physical integrated training method increased players' performance in end-game conditions compared with traditional training methods. Such a transformation of the body's functional state in the experimental group was due to improvements in fustal-game-specific motion-relational enchants, related to the nature and type of integrated ball training. To gain this training, players must be explosive, make rapid changes of direction, and do repetitive high-intensity tasks over a short period (Fajar et al., 2026). This is in accordance with the principle of specificity, which states that physiological adaptation will occur best when the training stimulus matches the conditions of the match (Li & Hao, 2025; Stone et al., 2022). In addition, reductions in times for the 50-meter sprint, the Illinois Agility Run, and the 2400-meter run suggest superior overall physical performance. These results align with previous research suggesting that combining technical and physical training can lead to more efficient movement behaviour and improved neuromuscular coordination (Wan et al., 2025). So not only do athletes get faster and more agile, but they also consume energy more efficiently during game activities.

As shown in the posttest, the number of subjects in the very high category increased, and the number in the very poor category decreased after the intervention in the experimental group. These findings suggest that integrated ball training affects not only average physical potential but also the distribution of athletes' capabilities, favoring more elite results. These findings support the work of Darisman et al., (2025), which asserts that structured and contextualized training programs have a positive influence on athletes of all ability levels. Although times were reduced on some of the test items in the control group, statistical tests indicated that these changes were not significant. This concludes that unintegrated or non-game-specific training is insufficient to trigger the stimulus required for peak physiological adaptations (Anwar & Hasmyati, 2025). This finding supports previous research suggesting that conventional training tends to be less effective in improving athlete performance in dynamic games like futsal.

Another benefit of integrated ball-based training is its greater impact on the athlete's psychological side (i.e., motivation to train). According to An Peng (2024), enjoyable, varied training leads to greater adherence to the chosen training platform. Good outcomes more often land and are comparable to existing approaches, but this environment benefits from using a ball as the ultimate medium, engaging more closely with game reality.

The above provides substantial evidence that integrated ball-based training can significantly enhance the physical conditioning of futsal athletes. Moreover, Himawan (2025) and Clemente et al., (2021) found that game-based training, such as small-sided games, improved athletes' aerobic capacity, speed, and agility because it involves physical activity similar to match

conditions. Further, Barus et al., (2025) stated that training that engages both technical and physical elements within a single session can enhance movement efficiency and athletes' performance.

On the other hand, several studies have also provided a more critical perspective on the effectiveness of integrated ball-based training. Research by Yılmaz et al., (2025) stated that although game-based training is effective, control over training intensity is often less measurable than separate physical training methods. This can lead to uneven variation in training load between individuals. Furthermore, Martínez-Vizcaíno et al., (2022) suggested that, for the development of certain physical components, such as maximal aerobic endurance (VO2max), high-intensity interval training (HIIT) can be more effective than game-based training.

This study has several limitations, including the limited sample size from a single team, the relatively short duration of the study, and the focus on measuring physical condition components only on speed, agility, and endurance. Furthermore, external factors such as diet, rest, and activities outside of training were not fully controlled, which could influence the results. Nevertheless, the results of this study still strengthen that integrated training with the ball is an effective method in improving the physical condition of futsal athletes, so coaches are advised to design training programs that do not only focus on one aspect, but integrate various physical and technical components according to the characteristics of the sport to help athletes achieve optimal performance and be able to compete competitively in matches.

CONCLUSION

Based on the research results, it can be concluded that integrated training with the ball has a significant effect on improving the physical condition of Skensa Futsal Academy athletes, especially in the aspects of speed, agility, and endurance, as shown by a significant difference between the pretest and posttest results in the experimental group. This training has proven more effective than conventional methods because it combines physical and technical aspects into a single activity that aligns with the characteristics of the futsal game. Thus, integrated ball training can be an effective alternative for coaches to improve athletes' physical performance and overall game quality.

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