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Tactical games and action-research models for skill development in youth football

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ABSTRACT

In the football context, the Tactical Games Model (TGM) emerges as an innovative approach that integrates technical and tactical learning through realistic game situations. Despite the fact that the TGM is widely used in physical education to develop students' tactical and decision-making skills, its use in the training of young footballers is still limited. This study employed a quasi-experimental design (non-randomized) to evaluate the effectiveness of a new methodological approach, TGM, compared to action research, in improving learning and the development of key competences related to technical-tactical performance in football. The sample included 40 young footballers between the ages of 11 and 13, divided into an Experimental Group (EG) and a Control Group (CG), with equal distribution based on age and experience. Using an action-research approach, the EG followed the TGM while the CG followed a traditional approach. Two distinct 9-month training protocols were implemented. Performance was evaluated using the Game Performance Assessment Instrument (GPAI), administered before and after the intervention. The EG benefited significantly from the TGM approach, with a significant increase in total scores, from a pre-test average of 15.25 to a post-test average of 22.45. Statistical analysis confirmed the difference between groups ($p = .00026$). This study shows that TGM represents a promising methodology for the development of technical-tactical skills in young footballers.

KEYWORDS

Cognitive Learning; Ecological-Dynamic Approach; Game-Based Learning; Skill Development; Technical-Tactical Skills

1. INTRODUCTION

In recent years, football training has evolved significantly, moving from a model focused solely on physical performance to a more integrated approach that also considers the cognitive and decision-making development of athletes (Aliberti et al., 2021; D'Isanto et al., 2021). This evolution reflects a growing interest in training methods that go beyond physical conditioning, focusing instead on the integration of tactical awareness and cognitive development. Such a shift aligns with current trends in sports science literature emphasizing holistic player development.

In this context, two main modes of teaching can be distinguished: prescriptive teaching, which falls under the cognitive approach, and heuristic learning, typical of the ecological-dynamic approach (Aliberti et al., 2025; Esposito et al., 2024).

Prescriptive learning is based on a structured and sequential model, in which the coach guides the learning process through well-defined phases: the initial command, the execution of the exercise with strict sequences and timings, the achievement of a specific objective, the monitoring of the performance and a final check, with possible reshaping of the training (Altavilla et al., 2022).

This method allows the development of technical skills in a systematic manner, but risks limiting the player's decision-making autonomy, as it emphasises mechanical repetition over the ability to adapt in variable game situations (Di Domenico et al., 2023).

In contrast, heuristic learning, typical of the ecological-dynamic approach, places the player at the centre of the competence acquisition process, fostering the development of decision-making capacity through situated practice (Csikar, 2018).

This model is based on three key elements: the alteration of the environment such as, for example, changing the size of the field to stimulate different game solutions, the variation of rules to encourage specific tactical strategies, and the management of relational dynamics to improve communication and cooperation between players (D'Isanto et al., 2022ab).

These factors enable the development of flexible strategic thinking, greater adaptability and a better understanding of game dynamics. In the context of youth coaching, it is crucial to balance prescriptive teaching with strategies that foster autonomous decision-making and problem-solving in real match situations (Raiola, 2014; Giardullo et al., 2024). Despite the theoretical frameworks supporting these approaches, there is still a lack of empirical studies directly comparing structured cognitive models, such as Action-Research, with game-based ecological models like TGM, especially in youth football contexts.

Given the increasing emphasis on decision-making and adaptability in modern sport, it is essential to explore how different pedagogical models contribute to these abilities. This sets the foundation for investigating models that can bridge technical training with real-game cognitive demands.

Among the emerging models, the Tactical Games Model (TGM) stands out for its game-centred approach, which integrates technical and tactical learning through practical and realistic contexts (Mitchell et al., 2020).

A traditional approach to football training, while effective in developing basic technical skills, often fails to fully develop the decision-making and problem-solving skills required in complex and dynamic game contexts (Gray et al., 2009).

This shortcoming may hinder athletes' ability to transfer what they have learnt into real competition situations, compromising their overall sporting growth. Consequently, it becomes essential to explore alternative methodologies that integrate technical and tactical learning in a more effective and contextualised manner. Although the TGM is widely used in physical education to develop students' tactical and decision-making skills, its use in the training of young footballers is still limited. This lack of adoption may stem from the very structure of the model, which requires not only a coach capable of designing, planning and conducting training sessions, but also an external evaluation system to measure learning effectiveness. This need for additional evaluation could be an obstacle to its implementation in the youth football context, where more traditional and standardised methodologies are often favoured. One of the main challenges in evaluating the effectiveness of training methodologies is the need for external evaluation, which is often complex to implement in the youth context. Evaluation, in fact, is traditionally considered a separate element from the training process, conducted by external parties to ensure its objectivity. However, this approach can be a practical limitation, especially when the aim is to directly improve the quality of the proposed activities. In this context, the action research intervention model proposed by Kemmis & McTaggart (1988) offers an effective methodological solution.

The latter allows the integration of evaluation within the process itself, turning the intervention designer and conductor (in this case the coach) into the main evaluator. Thus, observation and measurement of results occur in a continuous cycle of planning, action, observation and reflection, bypassing the need for external evaluation. Through this approach, evaluation becomes an integral part of training improvement, ensuring constant monitoring of established goals.

Despite increasing interest in innovative methodologies in youth football training, comparative studies between heuristic models like TGM and reflective frameworks such as Action-Research are still scarce. This study addresses this gap by evaluating the differential impact of these two approaches on the development of technical and tactical skills in young players.

The aim of the study is to evaluate the effectiveness of a new methodological approach, TGM, compared to action research, in improving learning and the development of key competences related to technical-tactical performance in football.

2. METHODS

2.1. Design

A methodological approach was adopted based on action-research, a cyclical and reflexive model that integrates practical action with scientific analysis, with the aim of improving a specific situation through direct intervention. According to the authors, action-research is developed through a continuous cycle of planning, action, observation and reflection, allowing researchers to make progressive changes and adjustments based on the evidence gathered. This method is characterised by the active participation of the researcher, who is not limited to an external observation role, but is directly involved in the context studied, actively contributing to the improvement of practice (Stringer, 2013).

Its application in the field of football training makes it possible to integrate theory and practice, ensuring that the teaching strategies adopted are constantly monitored and optimised on the basis of the data collected. Furthermore, the model proposed by Carr & Kemmis (1986) highlights how action-research is not limited to the mere collection of data but represents a transformative process that involves the participants themselves in the co-construction of knowledge.

This aspect is particularly relevant in sports contexts, where the adaptation of training methodologies to the athletes' needs is a crucial element for the success of the intervention (Raiola et al, 2025). The adoption of action-research in this study thus enables the reduction of evaluative subjectivity by using validated instruments for measuring results. The combination of reflexive practice and objective data makes it possible to scientifically test the effectiveness of TGM in the development of technical-tactical competences in young footballers, fostering continuous improvement of the teaching strategies adopted.

2.2. Participants

A convenience sample of 40 young footballers aged between 11 and 13 years was involved in the study. The sample consisted of 28 males and 12 females (mean age = 12.1 ± 0.7 years), all with at least two years of continuous football training experience. The participants were divided into two distinct groups: the Experimental Group (EG) and the Control Group (CG). This subdivision was made in order to ensure a fair distribution by age and level of sporting experience, using stratified allocation to balance the groups in terms of age and baseline skill level, in order to minimise possible bias and allow for a more accurate comparison between the groups.

All subjects gave informed consent for inclusion before participating in the study. The study was conducted in accordance with the Declaration of Helsinki. According to Regulation (EU) 536/2014 and Directive 2001/20/EC, research involving minimal risks for participants may be exempted from formal ethical review, as it does not involve invasive or experimental interventions. Furthermore, pursuant to Legislative Decree No. 211 of 24 June 2003, research that does not present significant risks and that aims exclusively to improve educational practices may be exempted from review and approval by the Institutional Review Board (IRB) or the Ethics Committee.

2.3. Study Tools

The study involved the application of a scientifically validated test, the Game Performance Assessment Instrument (GPAI), administered both pre- and post-intervention. The GPAI has demonstrated acceptable validity and reliability in previous studies assessing tactical behavior in game contexts (Mitchell et al., 2006).

The GPAI is a multi-dimensional tool designed to assess game behaviour that reflects a player's tactical understanding and ability to solve tactical problems by selecting and applying appropriate skills. This system allows for the analysis of both individual components of game performance (e.g. decision-making skills, skill execution and tactical support) and overall performance (such as the level of engagement and overall effectiveness of the game performance). Within the GPAI, seven key components, used by the young players, are assessed to make up the total score. The components assessed are as follows: Decision Making, Skill Execution, Support, Cover, Adjust, Base and finally Guard. In the period between the pre- and post-test phase, two separate 9-month training protocols were implemented. The CG followed a traditional approach, while the EG was subjected to an innovative TGM-based methodology. The latter is a game-centred pedagogical-didactic model designed to foster an in-depth understanding of the tactical, strategic and technical aspects of the game, while promoting higher levels of physical activity, motivation, involvement and playfulness. This approach encourages athletes to develop decision-making and problem-solving skills in realistic game contexts. In contrast, the traditional CG protocol focuses on teaching and perfecting fundamental technical skills through repetitive exercises. The typical structure of a TGM-based session for the EG includes (Table 1):

Table 1. Typical TGM training session

Total training session duration: 90 minutes	
Warm-up (15 minutes)	*Rondo (10 minutes):* players form a circle and pass the ball between them while one or two players in the centre try to intercept it. This exercise improves ball control and passing speed; *Mobility games (5 minutes),* dynamic stretching and joint mobility exercises to prepare the muscles for training.
Technical Skills Games (30 minutes)	*Ball Possession (15 minutes):* two teams compete compete to maintain possession of the ball in a defined area. This game improves passing, ball control and game vision; *Goal Shooting (15 minutes):* players take turns in shooting at goal from different positions, with the aim of scoring the most goals. the aim of scoring the most goals. This exercise improves the accuracy and power of the shot.
Tactical Games (30 minutes)	*Partita a Tema* (15 minuti): Theme Game (15 minutes): a game in which teams must follow specific tactical rules, such as high pressing or quick counterattacks. This game helps players understand and apply tactics; *Transition Game (15 minutes):*exercises that simulate transition situations between attack and defence, improving the players' reactivity and coordination.
Cool-down (15 minutes)	*Light running and static stretching (15 minutes):* Light running around the field followed by static stretching to promote muscle recovery muscle recovery.

2.4. Statistical Analyses

After checking the normality of the data with the central tendency indices: mode, mean and median, and the representativeness of the mean with the standard deviation, a T-test was performed for independent samples to analyse the differences between the groups. The Shapiro-Wilk test was also conducted to assess the normality assumption, and Levene’s test was used to verify the homogeneity of variances. Both assumptions were met. Significance was set at $P < .05$. This threshold indicates that results with a probability lower than 5% of occurring by chance are considered statistically significant. After checking the normality of the data by analysing the central tendency indices (mode, mean and median), the representativeness of the mean was assessed by calculating the standard deviation. This preliminary check was necessary to ensure that the data followed a distribution appropriate to the application of the T-test, which assumes the normality of the distributions in the tested groups. Next an independent samples t-test was performed to compare the scores obtained from the EG and CG in the post-test phase. This statistical test was chosen as the two groups consisted of distinct subjects, and it was assumed that significant differences could exist between the averages of the two groups as a result of the different training protocols applied. Effect size (Cohen's d) was also calculated to determine the magnitude of the differences observed. Statistical significance was set at $P < .05$, indicating that a probability of less than 5% obtaining the observed results by pure chance would be considered sufficient to reject the null hypothesis, i.e. the absence of differences between the groups. This criterion makes it possible to determine whether the improvements observed in the experimental group compared to the control group are statistically significant and not attributable to chance. The statistical analysis was conducted using the Statistical Package for Social Science software (IBM SPSS Statistics for Windows, version 25.0, IBM, SPSS Inc., Armonk, NY, USA).

3. RESULTS

Table 2 shows the pre-test and post-test GPAI scores of the control group athletes across several performance components.

Table 2. Control group GPAI pre and post scores

Control Group																
	Decision Making		**Skill Execution**		**Support**		**Cover**		**Adjust**		**Base**		**Guard**		**Total**	
Athlete	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	***Pre***	***Post***
1	3	4	3	3	2	3	3	3	2	3	2	2	3	3	**18**	**21**
2	3	2	3	5	4	4	4	2	2	3	2	3	2	3	**20**	**22**
3	1	2	1	1	1	2	2	1	1	1	1	1	1	1	**8**	**9**
4	1	3	1	2	3	1	1	3	1	2	2	1	1	1	**10**	**13**
5	1	1	1	1	1	2	1	1	2	1	1	1	1	1	**8**	**8**
6	2	1	2	2	2	1	1	2	2	3	1	1	1	2	**11**	**12**
7	2	3	1	2	3	2	2	3	2	1	2	2	2	2	**14**	**15**
8	3	2	2	4	2	3	1	2	2	1	2	3	2	2	**14**	**17**
9	2	2	2	1	1	1	1	2	2	2	2	2	1	2	**11**	**12**
10	1	4	2	4	1	2	2	1	2	1	2	2	2	1	**12**	**15**
11	3	4	3	3	2	1	2	2	2	3	3	4	3	2	**18**	**19**
12	2	2	2	3	2	2	1	2	2	2	1	2	1	2	**11**	**15**
13	3	4	2	3	3	2	4	3	2	2	3	4	2	4	**19**	**22**
14	1	1	1	2	1	2	1	1	2	2	1	2	1	2	**8**	**12**

15	3	5	3	5	4	2	3	2	2	2	2	2	2	3	**19**	**21**
16	3	5	4	5	2	2	3	3	3	4	2	2	2	2	**19**	**23**
17	2	2	3	4	3	2	3	4	2	2	3	2	3	3	**19**	**19**
18	1	1	1	2	1	1	1	1	2	1	1	1	1	1	**8**	**8**
19	2	1	1	1	1	2	1	2	2	1	1	1	1	1	**9**	**9**
20	1	3	2	3	3	2	1	2	2	1	1	1	1	1	**11**	**13**

Table 2 presented the results from the application of the GPAI test, where total data were analysed pre- and post-application of the training protocol. The totals are represented in the Total column. The data show a marginal improvement in the total scores from pre-test to post-test. The overall CG values went from a pre-test average of 15.25 to a post-test average of 15.25, suggesting a limited effect of the traditional protocol on technical-tactical learning. The improvements observed are unevenly distributed among the participants, with some subjects showing no significant progress. Decision-making aspects, such as Decision Making and Skill Execution, did not show substantial changes. In the following, Table 3 shows the data from the GPAI test of the experimental group.

Table 3. Experimental group GPAI pre and post scores

Experimental Group																
	Decision Making		**Skill Execution**		**Support**		**Cover**		**Adjust**		**Base**		**Guard**		**Total**	
Athlete	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	***Pre***	***Post***
1	3	5	4	5	3	4	3	3	2	3	3	4	3	3	**21**	**27**
2	3	5	3	5	4	5	4	4	2	3	2	4	3	3	**21**	**29**
3	1	2	1	2	1	2	2	3	1	2	1	2	1	1	**8**	**14**
4	2	4	2	3	3	3	3	3	1	2	2	3	2	3	**15**	**21**
5	1	3	1	3	1	2	1	1	2	3	1	3	2	1	**9**	**16**
6	2	3	2	2	2	2	1	2	2	2	1	3	1	2	**11**	**16**
7	2	4	1	4	3	4	2	3	2	2	2	4	2	2	**14**	**23**
8	3	5	2	4	2	4	1	2	2	2	2	3	2	3	**14**	**23**
9	2	2	2	2	1	3	2	3	3	2	3	3	1	3	**14**	**18**
10	2	4	3	5	2	3	3	3	2	4	3	4	3	4	**18**	**27**
11	3	5	3	5	3	5	2	3	2	3	2	4	1	3	**16**	**28**
12	2	4	2	4	2	2	1	3	2	3	1	3	1	2	**11**	**21**
13	4	4	4	5	3	4	4	4	3	4	3	5	3	4	**24**	**30**
14	1	2	1	2	1	3	1	1	2	2	1	3	1	1	**8**	**14**
15	3	5	3	5	4	4	3	5	3	4	3	4	3	4	**22**	**31**
16	3	4	4	4	2	4	3	4	3	4	2	5	2	4	**19**	**29**
17	2	5	3	5	3	4	3	4	2	3	3	3	3	4	**19**	**28**
18	1	2	1	2	1	2	1	1	2	2	1	3	1	1	**8**	**13**
19	2	2	1	3	1	2	1	1	2	3	1	3	1	1	**9**	**15**
20	3	5	4	5	3	4	2	2	2	3	2	5	2	2	**18**	**26**

Table 3 showed that the experimental group benefited significantly from the TGM approach, with a notable increase in total scores, from a pre-test average of 15.25 to a post-test average of 22.45. Increases are recorded in all technical and tactical components. The improvement is particularly evident in indicators crucial to situational play, such as Cover and Adjust. After organising and reporting all data in the respective tables, we proceeded with the analysis using descriptive statistics. At this stage, the focus was on the main summary and dispersion indices, such as mean, mode, median and standard deviation, calculated separately for both control and experimental group. These parameters provided a clear picture of the distributional characteristics of the data within each group. The detailed results of this analysis are presented in Table 4, providing a solid basis for interpretation and comparison between the groups, while Table 5 presents the results of an independent samples t-test comparing both groups.

Table 4. Descriptive statistics of total GPAI scores for control and experimental groups

Total Control Group		**Total Experimental Group**	
Average	15.25	Average	22.45
Standard Error	1.116561922	Standard Error	1.38312194537918
Median	15	Median	23
Mode	12	Mode	27
Standard deviation	4.993416719	Standard deviation	6.18550938207918
Sample Variance	24.93421053	Sample Variance	38.2605263157895
Kurtosis	-1.295061012	Kurtosis	-1.5503350022799
Asymmetry	0.091765503	Asymmetry	-0.222937285758
Range	15	Range	18
Minimum	8	Minimum	13
Maximum	23	Maximum	31
Sum	305	Sum	449
Count	20	Count	20
Confidence Level (95.0%)	2.336990962	Confidence Level (95.0%)	2.89490750185863

Table 5. T-test for independent samples between both groups

	Control Group	**Experimental Group**
Average	15.25	22.45
Variance	24.93421053	38.26052632
Observations	20	20
Assumed difference in averages	0	
df	36	
Stat t	-4.050485105	
P(T<=t) a tail	.000130055	
t critical one tail	1.688297714	
P(T<=t) two tails	.000260109	
t critical two tails	2.028094001	

The independent samples t-test shows a statistically significant difference between the two groups. The experimental group (M = 22.45) scored higher than the control group (M = 15.25). The result is significant ($t = -4.05$, $p < 0.001$), indicating that the difference between groups is not due to chance.

4. DISCUSSION

The results of this study highlight the effectiveness of the TGM approach compared to traditional training in promoting technical-tactical learning in young footballers. The EG, subjected to the TGM protocol, showed significantly greater improvements in all indicators assessed, particularly in the components related to tactical understanding and adaptability. These results suggest that the exposure to realistic and dynamic game contexts, typical of TGM, favours a better transferability of the skills learnt in match situations. This outcome highlights how training approaches based on realistic game scenarios can enhance not only technical execution, but also players’ ability to adapt to variable and unpredictable conditions during the match. In contrast, the CG that followed a traditional approach showed limited progress, probably due to the fragmented and less contextualised nature of the proposed exercises. These findings are in line with Mitchell et al.'s (2006) report that CG allows for the integration of technical and tactical learning, promoting greater game awareness and decision-making skills in young athletes.

Furthermore, studies such as that of Harvey & Pill (2016) emphasised that game-based models improve not only tactical performance, but also athletes' motivation and engagement, which are key determinants of long-term learning. Motivational aspects appear particularly relevant in the adolescent phase, as a stimulating and participatory training model helps maintain attention, interest, and emotional involvement during sessions—factors which contribute positively to long-term learning and sport adherence.

The improvement observed in EG compared to CG is attributable to the holistic nature of TGM, which encourages athletes to actively reflect on decisions made on the field, stimulating critical thinking and problem-solving skills. On the other hand, the traditional protocol followed by the CG showed limited progress, probably due to the divided and less contextualised nature of the proposed exercises. This result suggests that repetitive and fragmented exercises may limit the development of autonomous thinking and decision-making processes, essential in complex and dynamic game situations. Although traditional training is effective for the development of technical fundamentals, it does not adequately address the complexity of game dynamics, thus limiting the athletes' overall growth.

In summary, the TGM not only produced measurable improvements in technical-tactical indicators, but also supported a psychologically enriched training environment, reinforcing both cognitive engagement and motivation—two critical factors in youth sport development. These elements highlight the dual benefit of TGM on both performance and athlete psychology.

5. LIMITATIONS

Despite the positive results, this study has some limitations. The sample size was limited to 40 participants, which might reduce the generalisability of the results. Furthermore, the duration of the intervention (≈9 months) might be insufficient to fully assess the long-term effects of TGM. No follow-up evaluation was conducted, so it is unclear whether the improvements observed were maintained over time. In addition, the study focused solely on technical-tactical performance, without assessing psychological or motivational variables that may also have been positively influenced by the training model. Future studies could enlarge the sample and include a longitudinal evaluation to better understand the impact of TGM on technical and tactical performance. Moreover, it would be useful to explore its effects across different age groups, skill levels, and gender, as well as to compare its effectiveness in different cultural or sporting contexts.

6. PRACTICAL IMPLICATIONS

The results of this study suggest that coaches, trainers and sports educators should consider adopting TGM as a primary methodology for the development of technical-tactical skills in young footballers. This method encourages athletes to develop decision-making skills through problem-solving tasks in realistic situations, leading to greater game understanding and autonomy. This approach not only promotes more effective learning but also contributes to a more stimulating and engaging training environment. Furthermore, the integration of TGM with elements of traditional technical training could be an optimal strategy to balance the development of fundamental and situational skills. It is recommended that training programs progressively include small-sided tactical games, constraint-based scenarios and guided discovery strategies, adapting complexity according to the age and experience of athletes.

7. CONCLUSIONS

This study demonstrated that TGM represents an effective methodological approach for the development of technical-tactical skills in young footballers. The results showed significant improvements in key performance components, including decision making, tactical adaptation and support. The implementation of TGM can offer a competitive advantage in youth football training by providing athletes with essential tools to deal with the complexities of the modern game. However, further research is needed to explore the impact of the model on different age groups, cultural contexts and skill levels, as well as to evaluate its long-term effectiveness. Coaches and educators are encouraged to integrate TGM into their programmes, adopting a balanced approach that combines technical and tactical elements in a playful and motivating context.

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The authors declare no conflict of interest.

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