A Tactical Games Model lesson plan to teach net games skills in elementary school

Un piano di lezione basato sul Tactical Games Model per insegnare abilità nei giochi di rete nella scuola primaria

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ABSTRACT

The study aimed to assess the efficacy of two physical education approaches, Traditional Teaching (TT) and Tactical Games Model (TGM), on some fourth-grade classes over a 13-weeks period. Using the Game Performance Assessment Instrument (GPAI), indices of tactical awareness and game play skills were measured. Data were collected at two intervals: pre and post intervention. The mixed ANOVA analysis revealed that, prior to the administration of the protocols, the skill levels between the TT and TGM classes were largely comparable. However, following the intervention, the TGM classes demonstrated superior performance in some indices of the GPAI compared to the TT classes. Within-subject analysis indicated no improvement in tactical awareness and gameplay skills for the TT classes over time. In contrast, the TGM classes exhibited significant improvement from pre to post test in some indices. These findings substantiate the efficacy of the Tactical Games Model (TGM) in significantly enhancing students' performance, particularly in terms of tactical awareness and gameplay skills, when compared to conventional pedagogical approach, thereby highlighting the potential of TGM to foster a deeper understanding of game dynamics and improve overall physical education outcomes.

Lo studio mirava a valutare l'efficacia di due approcci di educazione fisica, l'Insegnamento Tradizionale (IT) e il Tactical Games Model (TGM), su alcune classi di quarta elementare nell'arco di un periodo di 13 settimane. Utilizzando il *Game Performance Assessment Instrument* (GPAI), sono stati misurati gli indici di consapevolezza tattica e abilità di gioco. I dati sono stati raccolti in due momenti: pre e post intervento. L'analisi ANOVA mista ha rivelato che, prima della somministrazione dei protocolli, i livelli di abilità tra le classi IT e TGM erano ampiamente comparabili. Tuttavia, dopo l'intervento, le classi TGM hanno dimostrato prestazioni superiori in alcuni indici del GPAI rispetto alle classi IT. L'analisi intra-soggetto ha indicato che non vi è stato alcun miglioramento nella consapevolezza tattica e nelle abilità di gioco per le classi IT nel tempo. Al contrario, le classi TGM hanno mostrato un miglioramento significativo dal pre al post test in alcuni indici. Questi risultati dimostrano l'efficacia del Tactical Games Model (TGM) nel migliorare significativamente le prestazioni degli studenti, in particolare in termini di consapevolezza tattica e abilità di gioco, rispetto all'approccio pedagogico convenzionale, evidenziando così il potenziale del TGM nel favorire una comprensione più approfondita delle dinamiche di gioco e migliorare i risultati complessivi nell'educazione fisica.

KEYWORDS
Game-based approach, Tactical awareness, Decision making, Physical education
Approccio basato sul gioco, Consapevolezza tattica, Processo decisionale, Educazione fisica

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1. Introduction

In contemporary society, there exists an escalating demand for educators to exhibit vigilance and responsiveness towards the diverse needs of students, thereby providing them with adequate support to effectively navigate the challenges inherent in daily life (Wright & Craig, 2011; Taggart, 1988). Consequently, the development of pedagogical environments that foster collaboration and cohesion among students becomes imperative in facilitating the attainment of favorable educational outcomes (Bessa et al., 2021). Illustrative paradigms of such educational approaches include cooperative learning (Dyson et al., 2004), experiential learning (Tapps et al., 2014), and problem-based learning (Jones & Turner, 2006). Nevertheless, prevailing educational norms often adhere to a teacher-centered approach (TCA) within school settings, wherein teachers assume sole responsibility for decision-making regarding curriculum planning, instructional delivery, and assessment (Mosston & Ashworth, 2008). Consequently, within this framework, students typically adopt a passive, receptive, and reproductive role (Rosado & Mesquita, 2009; Rosenshine, 1978). In elementary school, a playful approach within the domain of physical education (PE) is traditionally employed. This approach is predicated on the premise that play serves as a tool through which children learn and develop. PE teachers implement a diverse array of games, activities, and challenges designed to be both enjoyable and engaging for students. Nonetheless, despite the playful approach, the instructor remains central to the educational experience. Conversely, as posited by Pickard and Maude (2014), Physical Education (PE) pedagogy ought to transcend mere dissemination of knowledge and skills, operating within creative contexts wherein students are active explorers capable of application, discernment, and decision-making based on their acquired proficiencies. In light of society's imperative to foster the cultivation of autonomous, critical, and responsible thinkers, the pedagogical approach to sports education within school environments should undergo a paradigmatic shift from the conventional teacher-centered approach towards student-centered methodologies (Silva et al., 2021). In this perspective, numerous studies have underscored the efficacy of interventions based on Games Based Approach (GBA) for enhancing students' tactical awareness, game performance, levels of physical engagement, and intrinsic motivation towards participation in physical education activities (Silva et al., 2021). GBA encompasses instructional strategies that prioritize experiential learning of motor and sports skills within the context of gameplay scenarios (Bunker & Thorpe, 1982). The Tactical Games Model (TGM), as proposed by Griffin, Mitchell, and Oslin in 1997, aligns with the underlying principles of the GBA philosophy. Utilizing the fundamental principles of Tactical Games for Understanding (TGfU) and situating them within an educational context, the authors have devised a model characterized by the use of modified games. It focuses on fostering skills and competencies related to tactical awareness and decision-making through structured questioning activities, emphasizing the enhancement of technical abilities (Sgrò et al., 2020; Sgrò & Lipoma, 2019). Consequently, students are actively engaged in tasks designed to elicit decision-making, critical analysis, and problem-solving, thereby assuming an active role in their learning process. The authors assert that by modifying the game structure and reducing the traditional technical demands, participants are afforded the opportunity to primarily foster tactical awareness within the game context (Griffin et al., 1997). It is the ability to identify and address the tactical problems inherent in gameplay, necessitating utilization of both on-ball skills, such as passing and shooting, and off-ball skills, including support and coverage (Griffin et al., 1997). In addition, the TGM offers operational directives within four categories of sports: invasion games, net/wall games, strike/fielding games, and target games. In the specific case of net/wall games, S.H.A.P.E America has delineated minimum performance benchmarks for this sporting category, stratified across different age cohorts. For instance, it is anticipated that a student aged 9–10 years should demonstrate proficiency in "volleys underhand using a mature pattern, in a dynamic environment; strikes an object with a short-handled implement, alternating hits with a partner over a low net or against a wall" (America, S.H.A.P.E., 2014, pp. 9–10). However, extant research has predominantly concentrated on examining the impact of single net games (e.g., only volleyball, tennis, badminton, etc.) on pupils' tactical awareness (Sgrò et al., 2021; Liu, et al., 2020; Kolman et al., 2019; Broek et al., 2011). This narrow focus highlights a significant gap in the literature, as there is a lack of comprehensive studies investigating the effects of multi-unit approaches based on the implementation of multiple games within the net games category on tactical awareness. Yet as stated by Griffin, Mitchell & Oslin (1997), it would be wise to teach consecutive games with similar tactical goals to capitalize on their similarities. Beyond acquiring a large amount of experience in two or more games, students can achieve a deep tactical awareness within the same game category. In addition, empirical evidence suggests that the attainment of proficiency in sports necessitates temporal investment. The implementation of a multi-unit instructional approach over an extended duration could foster the enhancement of social and educational dynamics within collaborative learning environments, consequently it could augment student learning outcomes (Araújo et al., 2016; Brunton, 2003; Wallhead & O'Sullivan, 2005). Consequently, the aim of this study was to evaluate the tactical awareness and gameplay skills of some fourth-grade classes that have undergone a long-term instruction based on two different pedagogical approaches (traditional and TGM teaching) in the context of net games. It is hypothesized that students subjected to teaching based on the TGM will demonstrate greater tactical awareness and gameplay skills compared to those subjected to traditional play-based teaching.

2. Methods

2.1 Participants and procedures

Under the presumption that educational intervention serves as the primary determinant for elucidating changes in student performance, a quasi-experimen-

tal design with a non-equivalent control group and a Pre-Post tests was employed. Additionally, with the aim of ensuring ecological validity (Harvey and Jarrett, 2014), six intact fourth-grade classes (mean age: years old) were recruited: the TGM classes (20 male and 18 female) followed a structured physical education (PE) curriculum formulated in accordance with the Tactical Games Model, while the TT classes (14 male and 18 female) participated in PE sessions primarily oriented towards the refinement of ballistic skills and engagement in net games following a Traditional Teaching approach. All children were enrolled in two PE lessons per week, with each lesson lasting 60 minutes, and the teaching plan covered 13 weeks.

Both instructional modalities were administered by the same PE teacher, possessing over 15 years of experience in the field of physical education. The teacher was supported by a PE expert throughout the duration of the project. The expert, holding a master's degree in PE and nearing completion of a doctoral program in the same field, possessed two years of experience in implementing the TGM within the context of secondary school physical education. This expert provided guidance to the teacher in structuring the instructional unit within the framework of the TGM, as well as assisted in configuring the learning environment.

Data acquisition took place at two times: prior to the initial session of the instructional unit (pre-test: PreT) and subsequent to the end of the unit (post-test: PostT). The evaluation of tactical awareness and gameplay skills was carried out through the utilization of the Game Performance Assessment Instrument (GPAI). Each match adhered to a standardized format, constituting a small-sided volleyball game featuring teams of four players each, with a duration of 10 minutes per match. The playing field dimensions were reduced (i.e.,), while the net height was fixed at 1.60 m. Additionally, a soft ball was utilized, ensuring ease of handling and facilitating consistent bounce characteristics. Each match was scheduled to allow the same playing time for all students, and teams with similar skill levels played each other.

All instructional and assessment sessions were conducted within the school's gymnasium.

The School Board approved the protocol, with all participants submitting informed consent forms signed by their parents or legal guardians. The Ethics Committee at University of Enna "Kore" approved the study's design and methodological procedures.

2.2 Tactical Games Model

Different pedagogical approaches prioritize experiential learning of motor and sports skills within game-based contexts. One such method is the Tactical Games Model. Central to this instructional model is the systematic progression of educational content characterized by escalating levels of tactical complexity. Consistent with this approach, each instructional intervention was meticulously designed in adherence to three fundamental principles: the utilization of modified game situation, the development of skills and competencies pertinent to tactical awareness and decision-making through structured questioning activities, and the refinement of technical proficiencies. In each instructional session, both the teacher and the PE expert engaged students in small-sided games. More specifically, the structure of each lesson adhered to the following framework: Game 1 (15 minutes) – Practical Task (15 minutes) – Game 2 (20 minutes) – Closure (10 minutes). Game 1 served to introduce students to the tactical problem addressed in the lesson, while the subsequent Practical Task component focused on training technical skills necessary for effectively addressing the identified tactical problem. Game 2 was designed to consolidate the lesson's thematic focus, while the Closure phase involved a period of interactive discussion centered around the motor and sports skills employed to resolve the tactical problem identified in the lesson. In accordance with the recommendations of Griffin and colleagues (1997), a sequential approach was adopted to delineate the specific tactical problems and corresponding technical proficiencies requisite for their resolution. For instance, the instructional progression advanced from addressing the tactical problem of "maintaining a rally" to "setting up an attack", then "winning a point", and so forth. In parallel, students practiced skills of moving to catch, reading, anticipating, and underhand throwing for the first problem; seeing court spaces, opening up to teammates, passing, and shooting for the second; attacking spaces, passing, and shooting for the third. Furthermore, modifications were made to equipment, playing area configurations, and game regulations to ensure alignment with the developmental capabilities of the participating students.

2.3 Traditional Teaching

As previously mentioned, the TT classes received instruction utilizing a conventional skill-based approach. This instructional framework adhered to a traditional lesson structure, characterized by a warm-up activity, a demonstration and elucidation of the key skills to be addressed during the session, subsequent guided exercises led by the PE teacher, and culminating in a match wherein students could apply the acquired skills. The selection of net games for instruction reflected those utilized in the TGM classes.

Within this instructional paradigm, the teacher and the PE expert assumed sole responsibility for all aspects of lesson delivery, with students participating without being involvement in decision-making processes.

2.4 Game Performance Assessment Instrument (GPAI)

It is imperative that tactical awareness and gameplay skills are assessed authentically within the context of genuine game scenarios (Griffin, Mitchell, & Oslin, 1997). Consequently, the assessment of tactical awareness and gameplay skills was conducted utilizing the Game Performance Assessment Instrument (GPAI). This evaluative instrument was conceptualized and subsequently validated by Oslin, Mitchell, and

Griffin in 1998, employing a multidimensional approach including tactical competence, technical skills, motor skills, and intellectual abilities. In the development of the GPAI, the authors formulated simple and composite indices designed to capture the holistic learning progress of individual students relative to the game-specific context in which they are assessed. The following simple indices were selected for our study:

- *Decision Making:* a) the student aims to pass the ball to the teammate who is in the best position to receive the pass; b) the student aims to transmit the ball over the net when appropriate (third touch or functional pass to the shot);
- *Skill Execution*: a) receiving (controls the ball with both hands and makes it playable), b) pass (use the bagher or dribble to pass the ball to a teammate), c) shooting (the ball is hit with a gesture of the arm consistent with an attack on the ball after two previous touches or when there is an intention to send it into the opponent's field to score).
- *Adjusting*: the player moves to change his or her positioning and/or posture to play the ball. Subsequently, following the data acquisition phase through video recordings, each evaluator meticulously observed and documented individual occurrences on designated datasheet, delineating them in accordance with predetermined criteria. The evaluators comprised three students specializing in motor science who had received prior training in the utilization of the assessment tool. Ultimately, based on the count of identified and annotated events, composite indices were computed to characterize the overall dynamics of the game process:
- *Decision Made Index (DMI),* represented by the number of appropriate responses of the decision making related to the Sum of the number of appropriate responses and the number of inappropriate responses;
- *Adjustment Index (AI),* represented by the number of off the ball movements appropriate / number of totals off the ball movements;
- *Skill Execution Index (SEI),* represented by the number of effective Skill Execution Responses compared to the Sum of the number of effective Responses to the number of ineffective Responses;
- *Game Performance (GP)*, represents the sum of the decision made index and the skill execution index divided by 2: $\frac{(DMI+SEI)}{2}$.
- *Game Involvement (GI)*, represented by the total number of appropriate responses of the decision making + the total number of efficient responses of the Skill Executions + the total number of inefficient responses of the Skill Executions + the total number of inappropriate Responses of the decision-making.

Additionally, in accordance with Memmert and Harvey (2008), a constant value () has been applied to calculate both the Decision-Making Index (DMI) and the Skill Execution Index (SEI) across all potential responses (appropriate/inappropriate, efficient/inefficient). This ensures a non-zero numerator and divisibility in all cases.

2.5 Data Analysis

The data were preliminarily checked for missing values and adherence to the normal distribution assumption. In detail, the following aspects were checked: univariate normality within and across groups, homogeneity of variance within and across groups, and heteroscedasticity. As the assumptions were confirmed, a Mixed ANOVA was employed to analyze the within-subject (i.e., time effect) and the between-subject effects (i.e., TT versus TGM). The post hoc test with Bonferroni-Holm correction was performed.

If the comparison was statistically significant, the effect size was estimated by means eta-squared and Cohen's d for ANOVA main statistics and post-hoc test, respectively. Eta squared was interpreted as follow: small (), medium (), and large () effect. As for Cohen's d, the interpretation was as follows: small (to), moderate (to), and large () effect (Cohen, 2013). Additionally, confidence intervals () were provided for each effect size estimate to facilitate a more comprehensive interpretation of the results. The analyses were conducted using R for Mac OS X, with the alpha test set at .

3. Results

Data screening revealed that 4 students were univariate outliers and their data were removed. A mixed ANOVA was conducted to assess the effect of time and group distinction on the indices of tactical awareness and gameplay skills. The means and standard deviations of these indices for each group, distinguished by the evaluation time (PreT or PostT), are presented in *Table 1*.

		PreT		*PostT*	
Indices	*Group*	*M*	*DS*	*M*	*DS*
DMI	TT	0.414	0.058	0.424	0.061
	TGM	0.426	0.073	0.458	0.031
AI	TT	0.512	0.052	0.521	0.056
	TGM	0.538	0.069	0.575	0.060
SEI	TT	0.413	0.062	0.421	0.053
	TGM	0.442	0.052	0.461	0.034
GP	TT	0.446	0.041	0.454	0.041
	TGM	0.468	0.030	0.498	0.022
GI	TT	62.531	10.371	63.281	12.400
	TGM	64.053	17.383	67.289	13.217

Table 1. Descriptive statistics. Note: PreT= Pre-Test; PostT= Post-Test; M: Mean; SD: Standard Deviation; TT classes: Traditional Teaching; TGM classes: Tactical Games Model classes; DMI: Decision Making Index; SEI: Skill Execution Index; AI: Adjustment Index; GI: Game Involvement; GP: Game Performance

Regarding the within-subject effects, the time was significant for the following variables: DMI ($F(1) = 7.83$, $p = 0.007$, $\eta^2 = 0.03$); AI ($F(1) = 8.30$, $p = 0.005$, $\eta^2 = 0.03$); GP ($F(1) = 13.32$, $p < 0.001$, $\eta^2 = 0.06$).

Concerning the between-subject effects, the group variable was significant for the following variables: SEI ($F(1) = 13$, $p < 0.001$, $\eta^2 = 0.10$); AI ($F(1) = 11.52$, p

= 0.001, η^2 = 0.10); GP (F(1) = 27.93, p < 0.001, η^2 = 0.18). Post-hoc pairwise comparisons with Bonferroni-Holm adjustment showed that the TGM classes exhibited statistically significant differences between PreT and PostT for the variables DMI (md = -0.03, p = 0.015), AI (md = -0.04, p = 0.007) and GP (md = -0.03, p < 0.001), with PreT as the baseline. Additionally, post-hoc pairwise comparisons indicated that there were no significant differences between the two groups at PreT, except for the GP variable (md = -0.02, p = 0.04), with the TT classes serving as the baseline. Similarly, statistically significant differences were recorded at PostT for the variables SEI (md = -0.40, p = 0.008), AI (md = -0.05, p = 0.001), and GP (md = -0.04, p < 0.001).

The time group interaction was significant only for the GP variable (F(1) = 4.15, p = 0.046, η^2 = 0.02), indicating that the change in GP scores between the PreT and PostT conditions varies differentially based on the group membership as showed in *Figure* 1. In particular, the TGM classes exhibited a significantly greater increase compared to the TT classes, suggesting that the effect of time on GP is influenced by group membership and, consequently, by the pedagogical approach employed. This is further confirmed by the simple contrasts, which show significant differences for both the Time factor and the Group factor, as well as a significant interaction between the two. Specifically, a significant increase in scores was observed between PostT and PreT (estimate = 0.019, SE = 0.005, t(68) = 3.651, p < 0.001), regardless of the group. Furthermore, the TGM classes achieved significantly higher mean scores compared to the TT classes (estimate = 0.033, SE = 0.006, t(68) = 5.285, p < 0.001). Regarding the interaction, the contrasts indicated that the variation between PreT and PostT significantly differs between groups (estimate = 0.022, SE = 0.008, t(132.087) = 2.735, p = 0.007), with a greater increase in TGM classes compared to TT classes (estimate = 0.052, SE = 0.008, t(132.087) = 6.395, p < 0.001).

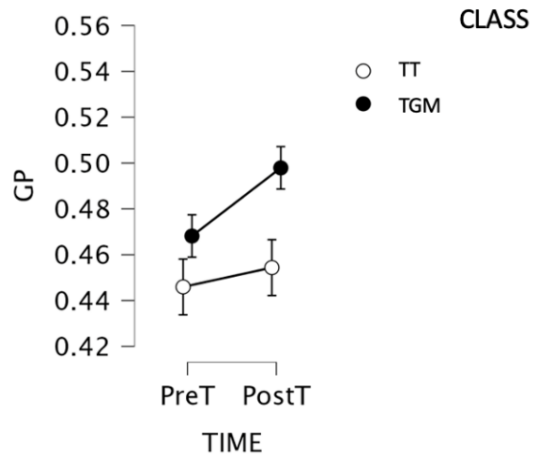

Figure 1. Interaction Plot time group for GP index. Note: GP: Game Performance; TT: Traditional Teaching; TGM: Tactical Games Model; PreT= Pre-Test; PostT= Post-Test

4. Discussion

This study investigated the influence of two different teaching approaches (the Tactical Game Model and Traditional Teaching) on the tactical awareness and gameplay skills in a sample of 70 fourth-grade students. Between-subject analysis revealed that before the administration of the protocols, the skill levels of the TT classes and TGM classes were not different except for GP, which is better in TGM classes. On the contrary, after the protocol, TGM classes showed a better performance in SEI, AI and GP than the ones obtained from the TT classes. Within-subject analysis didn't reveal any improvement over time in the tactical awareness and gameplay skills for the TT classes. Conversely, the TGM classes showed an improvement from PretT to PostT for DMI, AI and GP. A time group interaction was observed for the GP variable, indicating that the change in GP scores between the PreT and PostT conditions depends on the teaching approach. Thus, this study confirmed earlier research about the effectiveness of an approach related to the tactical games to promote students' tactical awareness in games and sport (Araújo et al., 2022; Sgrò, et al., 2021; Práxedes et al., 2016; Olosová & Zapletalová, 2015; Mesquita et al., 2012). Moreover, according to the findings of Broek et al. (2011), it is remarkable to observe that the outcomes of this investigation suggest that the pivotal factor in enhancing students' tactical awareness is the level of active engagement of students in decision-making processes. Presumably, the interactive activities involving answers and questioning facilitated the development of gameplay skills and tactical awareness among TGM's students. Drawing upon the socio-constructivist theory elucidated by Darnis-Paraboschi and colleagues (2005), it is hypothesized that social interactions among peers play a pivotal role in fostering cognitive development. Accordingly, dyadic verbal exchanges between students and instructors concerning tactical problems and potential solutions may have exerted a positive influence on the tactical decision-making processes of the TGM classes, as articulated by Broek et al. (2011). Conversely, the absence of heightened tactical awareness and gameplay skills among students in the TT suggests a potential explanation found in their passive engagement during the PE lessons. Moreover, in the specific context of the TGM classes, it is worth noting that the protocol positively influences the AI variable, which reflects the player's off-the-ball movement as dictated by the flow of the game. Probably, the TGM holds promise in fostering the development of students' off-the-ball skills, thereby potentially enhancing their ability to comprehend game dynamics. Despite the acknowledged challenges in developing offensive off-ball decisions among young players (Blomqvist, et al., 2005; Mesquita et al., 2012), scholarly literature underscores the importance for educators of prioritizing the development of those skills within instructional frameworks (Quinto & Sgrò, 2023; Oslin et al., 2006, Blomqvist et al., 2005; McPherson & Kernodle, 2003;). Therefore, in light of the findings of this study, PE teachers are encouraged to consider integrating the TGM into their pedagogical practices. As recently stated by Quinto and Sgrò (2023), the integration of TGM into pedagogical practices could provide the opportunity to broaden educational perspectives and define a new objective: to make students physically literate. This enables them to apply the skills acquired over time and set perso-

nalized goals aimed at improving their quality of life. It is essential that physical education lessons promote a lifestyle oriented toward physical activity and sport. However, to achieve this objective, significant changes in the design and delivery of physical education lessons are necessary to genuinely support the development of the skills needed for active and informed engagement in the game. It is important to acknowledge that the present study is not free of limitations, as it did not inquire into the instructional methodologies employed by the tutors responsible for designing and implementing the protocols. Existing literature (Behzadnia et al., 2018) underscores the impact of teaching styles on student well-being and academic achievement, indicating that a more controlling instructional approach is inversely associated with students' overall well-being and academic performance, while fostering feelings of discomfort. Conversely, a pedagogical approach that prioritizes student autonomy leads positive outcomes in terms of student well-being and knowledge acquisition.

5. Conclusions

In summary, this study offers insights into the efficacy of employing a Game Based Approach within elementary school settings to foster the development of students' net games skills. It underscores the necessity of supplementing such approaches with a structured model, which can provide guidance to educators in terms of sequencing and progressing instructional proposals. Moreover, the findings highlight the importance of empowering students to assume an active role in their learning process, make decisions, and exercise autonomy in their choices. For this reason, PE teachers are advised to follow the trend of other countries (Barba-Martín et al., 2020) by adopting GBA.

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