E-FOOTBALL GAMES AS EDUCATIONAL TOOLS IN YOUTH FOOTBALL ACADEMIES: A THEORETICAL FRAMEWORK FOR TACTICAL, COGNITIVE, AND SOCIO-EDUCATIONAL DEVELOPMENT

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ABSTRACT
This theoretical article examines the educational potential of e-football games in youth football academies, focusing on tactical, cognitive, and socio-educational development. Drawing on game-based learning, situated learning, and ecological dynamics, it considers how coach-guided virtual scenarios may support tactical awareness, decision-making, reflection, and peer collaboration. A four-phase pedagogical framework is proposed: digital tactical exposure, guided reflection, field-based transfer, and reflective feedback. Risks include excessive screen time, sedentary behavior, and uncertain transfer to real-world performance. E-football games are therefore presented as complementary educational tools, not substitutes for on-field training; their value depends on structured pedagogical mediation and further empirical validation.

KEYWORDS
Decision-making; situated learning; digital responsibility; ecological dynamics; tactical awareness.

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1. Introduction

In recent years, digital technologies have progressively transformed the way young people interact with sport, influencing not only entertainment modalities, but also the processes of learning, socialization, and the construction of sporting identity (Vaamonde et al., 2018). In this scenario, eSports have assumed an increasingly international relevance, evolving from a simple video game phenomenon to a competitive, educational and cultural context capable of involving millions of young users (Chainarong et al., 2025). Among the various categories of competitive video games, e-football games, such as EA Sports FC and eFootball, today represent one of the most widespread forms of interaction between the digital environment and real football, especially in youth groups (Zagała & Strzelecki, 2019). Their popularity stems from their ability to simulate tactical dynamics, decision-making situations and strategic scenarios strongly connected to the structure of the contemporary football game (Ceruso et al., 2025a). The growing diffusion of these virtual environments has also changed the way young footballers experience sports outside the field, creating an increasingly evident continuity between real practice, digital experience and informal learning (Bertschy et al., 2020). In many cases, e-football games represent a daily space for peer discussion, tactical discussion, and virtual experimentation with game situations, influencing perceptions, languages, and ways of understanding football itself (Ervine, 2018). This phenomenon appears particularly relevant in new generations, who have grown up within digital ecosystems characterized by interactivity, communicative immediacy, and technology-mediated learning. Alongside the growth of eSports, scientific literature has begun to delve deeper into the relationship between video games, cognitive processes, and learning. Several studies have highlighted how interactive digital environments can

stimulate perceptual skills, rapid decision-making, selective attention, working memory, and problem solving, elements particularly relevant in situational sports such as soccer (Imanian et al., 2025). In particular, sports video games appear to require players to continuously read the game, anticipate actions, manage space and adapt quickly to variable situations, aspects that recall some of the main cognitive demands present in the real football context (Ceruso et al., 2025b). In youth football, in fact, the ability to quickly perceive information from the environment, interpret collective dynamics and make effective decisions represents one of the central aspects of young athlete development (Baltezarević & Baltezarević, 2018). E-football games, through the simulation of complex and constantly evolving scenarios, appear to at least partially reproduce such cognitive demands, offering players virtual experiences in which attention, anticipation and tactical choice play a fundamental role (Ceruso et al., 2025c). While digital experience cannot replace the physical, and relational components of real-world play, these environments could still contribute to the development of forms of tactical understanding and situational awareness, especially when integrated into structured educational pathways (Dašić et al., 2024). Despite these potentials, much of the scientific literature continues to analyze eSports primarily in relation to the risks associated with excessive video game use, such as a sedentary lifestyle, digital dependence, and social isolation, neglecting the possibility of interpreting them as complementary educational tools. This approach has limited the development of theoretical reflections regarding the pedagogical integration of e-football games in youth sports contexts, particularly in youth football academies, where the training process does not concern exclusively the technical-tactical dimension, but also involves cognitive, relational and emotional aspects (Kothroulas et al., 2025). Modern football academies represent complex educational environments, in which the coach progressively

assumes a role that is not only technical, but also pedagogical and formative. In this context, the guided use of e-football games could foster moments of tactical reflection, collaborative learning, peer discussion and the development of digital responsibility, transforming the video game from a simple recreational activity to a possible integrative teaching tool (Raya-Castellano & Uriondo, 2015). This perspective finds theoretical connections with models of game-based learning, situated learning, and the ecological-dynamic approach, according to which learning emerges through the continuous interaction between individual, environment, and task within meaningful and contextualized situations. In light of these considerations, it seems necessary to develop a theoretical-argumentative reflection capable of critically analyzing the educational potential of e-football games in youth football academies, moving beyond an exclusively recreational or performance vision of the phenomenon. Therefore, this article aims to discuss how these digital environments can be interpreted as complementary teaching tools to support the tactical, cognitive, and socio-educational learning of young footballers, highlighting their opportunities, limitations, and possible prospects for integration within youth football training.

2. Game-based learning and digital learning environments

The use of play as an educational tool represents one of the most in-depth principles in contemporary pedagogical literature. From the perspective of game-based learning, play is not exclusively a form of entertainment, but an active learning environment in which the subject develops knowledge, cognitive strategies, and problem-solving skills through direct experience and interaction with the context. In particular, interactive digital environments allow young users to learn through continuous processes of exploration,

adaptation, and immediate feedback, fostering forms of active participation that are difficult to find in traditional transmission models. Prensky (2009) highlights how new generations, defined “digital natives”, tend to learn in a more dynamic, experiential and interactive way than conventional educational methods. From this perspective, video games can represent tools capable of increasing motivation, engagement, and attention, stimulating complex cognitive processes through goals, progressive challenges, and the need for decision-making. Similarly, Gee (2003) argues that effective video games incorporate principles of situated learning, allowing users to build skills through contextualized experiences and authentic problems. In the case of e-football games, these characteristics take on particular relevance since the player is constantly involved in processes of observation, interpretation and tactical choice within dynamic virtual scenarios. Continuous interaction with the simulated context requires rapid adaptation, information management, and strategic understanding of the game, elements that can foster forms of cognitive and tactical learning that complement real-world experience.

3. Situated learning and ecological dynamics

Situated learning perspectives have progressively highlighted how educational processes cannot be interpreted exclusively as the transmission of theoretical content, but must be understood within contextualized and meaningful experiences for the learner. According to Lave and Wenger (1991), knowledge emerges through active participation in authentic social practices and situations, in which the individual builds skills through continuous interaction with the surrounding environment. From this perspective, context plays a central role in determining the quality, effectiveness, and transferability of learning. In the field of motor sciences and sports pedagogy, these principles

find application in models of the ecological-dynamic approach, according to which physical and decision-making behavior emerges from the mutual interaction between athlete, environment and task (Davids et al., 2008). Unlike traditional perspectives based on the analytical repetition of technical gestures, the ecological-dynamic approach considers the athlete as an adaptive system capable of perceiving relevant information from the environment and organizing functional responses in relation to the situational demands of the game. In this sense, learning is fostered through variable, dynamic experiences that are representative of the real performance context. One of the central concepts of ecological dynamics is represented by affordances, defined as opportunities for action perceived by the subject in relation to the characteristics of the environment (Silva et al., 2013). In football, such challenges can include free spaces, passing lines, opponent movements, and finishing opportunities, elements that require continuous processes of perception, anticipation, and decision-making. Consequently, the development of the young footballer does not depend exclusively on technical execution, but on the ability to quickly interpret complex scenarios and adapt to the variable dynamics of the game. From this perspective, e-football games can be interpreted as virtual environments characterized by perceptual-cognitive demands partially similar to those present in real football. Although such video games do not fully reproduce the physical, and relational components of field practice, they still require continuous processes of observation, spatial analysis, selection of relevant information, and decision-making in a short time. The player is in fact called upon to quickly interpret collective dynamics, anticipate the opponent's intentions and continuously adapt his tactical choices as the virtual situation evolves. Renshaw et al. (2019) emphasize how effective learning environments must possess representativeness characteristics, that is, the ability to maintain functional relationships with the perceptual and

decision-making demands present in the real performance context. In this sense, e-football games could offer young athletes complementary experiences of tactical reading and strategic understanding, especially when integrated into coach-led learning paths. Reductionist or deterministic interpretations must be avoided: virtual experience does not automatically produce a transfer of performance to the real context, but can only acquire educational value through intentional pedagogical design capable of connecting the digital environment, critical reflection, and concrete experience.

4. E-football games and tactical-cognitive development

In modern football, performance depends not only on the athlete's technical or physical abilities, but also on how quickly the player can perceive relevant information, interpret the dynamics of the game, and make effective decisions in contexts characterized by high spatial and temporal variability. In particular, decision-making represents one of the most determining aspects in situational sports, as it requires continuous processes of adaptation to the actions of teammates, opponents and game development (Araújo et al., 2006). From this perspective, the cognitive component plays a central role in the formation of the young footballer, especially during the evolutionary phases in which tactical reading, anticipation and situational awareness are consolidated. Scientific literature has progressively highlighted how interactive digital environments can stimulate various cognitive processes associated with attention, information processing speed, and problem-solving ability (Bavelier & Green, 2019). While much research has focused on action video games, e-football games also appear to require complex forms of cognitive processing, as the player is constantly involved in observing tactical configurations, managing virtual space, and quickly selecting the most functional game solutions. During

a virtual game, the user must simultaneously monitor the positioning of their teammates, the movements of their opponents, the available passing lines, and the possible evolution of the action, continuously adapting their behavior to the demands of the situation. From a theoretical point of view, these requests are consistent with the principles of tactical awareness, understood as the ability to understand the dynamic relationships present in the game and make effective decisions based on the context. Harvey et al. (2010) emphasize how tactical learning processes are most effective when the athlete is exposed to realistic, variable situations characterized by the need to interpret information from the environment. In this sense, e-football games could represent complementary tools to stimulate tactical understanding processes, especially in the youth stages, in which the player progressively builds his or her ability to read the game. A further relevant aspect concerns the potential of e-football games to foster forms of reflective learning. Unlike traditional, highly prescriptive exercises, virtual environments allow the player to experiment with different strategies, immediately observe the consequences of their decisions, and adapt their behavior based on feedback received from the game system. This process could contribute to the development of greater tactical awareness and situational analysis skills, especially when accompanied by moments of discussion and guided discussion with the coach. The possible cognitive contribution of e-football games should not be interpreted deterministically or automatically transferable to actual performance. The differences between the virtual environment and the concrete context remain significant, especially in relation to the perceptual-motor, biomechanical and relational aspects present in football played on the pitch. Furthermore, the quality of the educational experience depends heavily on how the video game is used: exclusively recreational and passive use may not produce any significant educational benefits. Conversely, integrating e-football games into

structured learning paths could foster processes of tactical reflection, collaborative learning, and cognitive development complementary to traditional training.

5. The pedagogical role of the coach in the integration of e-football games

The integration of e-football games into the educational paths of youth football academies requires in-depth reflection on the pedagogical role of the coach. Although digital environments can offer cognitive, tactical, and motivational stimuli, their educational potential cannot be considered automatic or independent of the teaching context in which they are used. In the absence of intentional educational mediation, the risk is that the video game will remain a simple recreational experience, devoid of any real educational significance. Therefore, the pedagogical value of e-football games depends primarily on the coach's ability to transform the virtual experience into reflective learning, connecting what happens in the digital context to the dynamics of the real game. In contemporary youth football, the role of the coach has progressively evolved from a simple transmitter of technical and tactical skills to a complex educational figure, also responsible for the cognitive, relational, and emotional development of the young athlete. Light (2013) highlights how sports learning processes are most effective when the athlete actively participates in the construction of knowledge through meaningful experiences, social comparison and shared reflection. From this perspective, the coach takes on the role of learning facilitator, creating contexts in which the player can analyze their decisions, interpret game situations, and develop greater tactical awareness. Applied to e-football games, this perspective implies that video games should not be used as a substitute for field training, but rather as a complementary tool integrated within a structured pedagogical design. The coach could, for

example, use specific virtual game situations to stimulate tactical discussions, analyze decision-making choices, or propose collective reflections regarding space occupation, offensive and defensive transitions, or managing numerical superiority. Through debriefing and guided discussion, the young athlete can be helped to develop metacognitive processes related to game understanding, transforming the virtual experience into mindful learning. A further relevant aspect concerns the social and relational dimension of learning. E-football games are frequently experienced by young people as shared experiences, characterized by collaboration, competitive comparison, and peer communication. If properly mediated, such environments could foster the development of socio-educational skills such as cooperation, respect for rules, emotional management, and digital responsibility. In this sense, the coach also takes on the task of educating the young athlete in the critical and conscious use of digital technologies, promoting balanced behaviors and combating possible tendencies related to excessive use, isolation, or communicative toxicity. From a methodological point of view, the pedagogical integration of e-football games could be more effective through blended models, in which virtual experience, practical field activity, and shared reflection are continuously linked together. One possible application could involve tactical analysis of simulated situations via video games, followed by reproducing the same dynamics in small-sided games or situational exercises in the real field. This connection between the digital environment and concrete experience could foster greater continuity between game-theoretic understanding and the practical application of tactical decisions. Despite this potential, scientific evidence regarding structured pedagogical protocols based on the integration of e-football games into football academies remains limited. Most of the experiences currently present appear episodic, unsystematized and often lacking a clear methodological framework. Consequently, there is a need to

develop further theoretical reflections and future empirical investigations aimed at understanding how these tools can be effectively used in youth football training processes.

6. Educational and social implications of e-football games in youth academies

In addition to cognitive and tactical-decisional aspects, the use of e-football games in youth football academies also opens up relevant reflections on the educational and social level. Contemporary football academies do not represent exclusively contexts oriented towards sporting performance, but rather training environments in which young athletes build identities, relationships, communication methods, and behavioral attitudes that influence their personal growth path. In this scenario, digital technologies are taking on an increasingly central role in young people's daily lives, making it necessary to develop educational approaches capable of critically and consciously integrating digital tools into sports training processes. E-football games, thanks to their high diffusion among teenagers, represent familiar and highly motivating environments for the new generations. Several studies highlight how emotional engagement and active participation fostered by digital environments can increase engagement, motivation, and a sense of belonging in learning processes (Filgona et al., 2020). In the sports field, this involvement could help create educational experiences that are more closely aligned with the languages and interests of younger generations, facilitating the active participation of young athletes and the development of more meaningful forms of learning. Socially, e-football games can also foster collaborative and communicative dynamics among peers. Multiplayer and competitive modalities frequently require cooperation, strategic coordination, and the

sharing of common goals, elements that could support the development of relational and social skills. In particular, tactical discussion, discussion of decision-making choices, and shared analysis of game situations could stimulate forms of collaborative learning that are also useful in the real-world football context. These aspects are consistent with socioconstructivist perspectives on learning, according to which knowledge emerges through social interaction and continuous comparison between individuals within the same educational environment. A further element of interest concerns the possibility of using e-football games as tools to promote forms of digital responsibility and conscious use of technologies. In the new generations, the relationship with digital environments often appears to be characterized by high technological exposure, but not always accompanied by adequate critical education in the use of the media. In this sense, youth football academies could play a significant educational role, guiding young athletes towards balanced ways of using video games and promoting the construction of responsible online behaviors, respect for rules, and management of virtual communication dynamics. From an inclusive perspective, e-football games could also represent tools capable of expanding opportunities for participation and involvement within youth sports groups. Some young athletes with different levels of technical ability, temporary physical limitations, or less relational security may find an initial space in the virtual environment for participation, expression, and discussion with their teammates. While this perspective requires further empirical exploration, it suggests the possibility of interpreting e-football games as tools of social mediation and educational inclusion as well.

7. Critical issues and limitations of e-football games in youth football education

Despite the potential educational and cognitive implications of e-football games, there is a need to adopt a critical and scientifically balanced perspective regarding their use in youth football contexts. One of the main critical issues concerns the risk of interpreting the relationship between virtual experience and real learning in an overly deterministic way, assuming that exposure to digital environments automatically produces improvements in the young athlete's tactical or decision-making skills. In reality, the transfer of skills from the virtual context to real play represents a complex process, influenced by numerous pedagogical, cognitive, and environmental variables. Although e-football games require attention, anticipation, and decision-making processes, they do not fully reproduce the perceptual-motor demands of football played on the field. In the real context, in fact, the player interacts through the moving body, continuously perceives information coming from the three-dimensional environment and must adapt his actions to physical, biomechanical and relational constraints that are absent or greatly reduced in the virtual experience. Consequently, the embodied component of real calcium represents an element that cannot be replaced by digital interaction. This aspect is particularly relevant in youth groups, where coordination, perceptual-motor, and relational development depends heavily on concrete movement experience. A further critical element concerns the risk of excessive exposure to screens and reduced physical activity levels. International literature highlights how prolonged use of video games can contribute to increased sedentary behaviors, especially in young adolescents, with possible repercussions on psychophysical well-being and active lifestyles. From this perspective, the integration of e-football games into football academies should

never result in a replacement for real-world physical training, but exclusively in a complementary, limited and pedagogically controlled use (Pizzo et al., 2018; Fung & Pelliccia, 2025). The balance between digital experience and physical practice therefore represents a fundamental condition for the use of e-football games to maintain educational and sporting coherence. From a psychological and social perspective, further critical issues may emerge in relation to the phenomena of digital addiction, social isolation, and communication toxicity present in some competitive online environments. The dynamics of hypercompetitiveness, frustration, or verbal aggression frequently associated with video game ecosystems could negatively influence the educational climate if not adequately mediated by competent adults. In this sense, the role of the coach and the educational context becomes central not only in the educational management of the tool, but also in promoting ethical behavior, mutual respect, and responsible use of digital technologies. Another significant limitation concerns the current paucity of scientifically validated methodological protocols for integrating e-football games into youth football academies. Most of the experiences in the literature still appear exploratory, descriptive, or based on preliminary observations, with limited empirical evidence regarding long-term educational, cognitive, or tactical effects. Furthermore, variables such as age, level of football competence, frequency of video game use, type of pedagogical mediation and individual differences in digital learning processes are still not explored in depth. In the light of these considerations, it appears necessary to avoid both completely enthusiastic positions and exclusively negative interpretations of the phenomenon. E-football games should be considered neither an automatic threat to youth development nor miraculous tools capable of directly improving football performance. Rather, their potential educational value appears to depend on the methods of integration within structured teaching paths, the quality of

pedagogical mediation, and the ability to maintain a balance between virtual experience, critical reflection, and real-world physical practice. Consequently, future research should further systematically explore the relationship between e-football games and youth football education, developing interdisciplinary protocols capable of integrating pedagogical, cognitive, and physical perspectives. In particular, it seems necessary to understand which methodological conditions can foster a truly educational use of digital environments within youth football academies, moving beyond purely recreational approaches or approaches oriented exclusively towards the technological dimension.

8. A theoretical framework for integrating e-football games in youth football academies

In light of the theoretical perspectives discussed in the previous paragraphs, it seems possible to hypothesize a pedagogical framework aimed at integrating e-football games into the educational paths of youth football academies. This proposal is not intended to replace traditional training or give virtual environments an autonomous training value, but to suggest an integrated model in which digital experience, cognitive reflection, and real-world physical activity can interact in a complementary way. From this perspective, e-football games are interpreted as educational support tools capable of promoting processes of tactical understanding, active participation, and decision-making awareness, provided they are included within a coach-led methodological design. A first phase of the framework could involve digital tactical exposure, that is, the guided exposure of young athletes to specific game situations through e-football games. At this time, the video game would be used not as simple competitive entertainment, but as an environment for tactical

observation and situational analysis. The coach could select particular game scenarios related to, for example, offensive and defensive transitions, space occupation, managing numerical superiority, or the collective dynamics of pressing and covering. Through such virtual experiences, the young athlete could be encouraged to focus attention on spatiotemporal relationships and potential emerging decision-making solutions in the game context. The second phase could be represented by guided reflection, a central element of the entire educational process (Johns, 2009). At this stage, the coach would take on the role of pedagogical facilitator, leading moments of discussion and collective discussion on the choices made during the virtual experience. Through stimulus questions, decision analysis, and shared reflections, the young athlete would be helped to develop greater tactical awareness and metacognitive skills regarding their actions. This process is consistent with the perspectives of reflective learning and game-based learning, according to which experience acquires educational value when accompanied by moments of critical interpretation and shared construction of knowledge. Subsequently, the framework could include a field-based transfer phase, in which situations observed or discussed in the virtual environment are re-proposed within field training. Through small-sided games, situational drills, or activities representative of the real-world context, young soccer players could concretely experience the tactical dynamics previously addressed in the video game. This connection between digital experience and real physical activity experience would be particularly important to avoid an artificial separation between virtual learning and concrete football practice. From this perspective, e-football games would not replace the real game but would constitute a preparatory and complementary tool for understanding the tactical situations experienced on the field. The last phase of the framework could finally concern reflective feedback, that is, a final moment of reworking the experience (Lichtenberger-

Majzikné & Fischer, 2017). Through shared feedback, peer comparison, and self-analysis of decisions made, the young athlete could consolidate their understanding of the game and develop greater cognitive autonomy. In parallel, this phase could also represent an educational opportunity to promote digital accountability, balanced technology management, and critical awareness of the use of virtual environments.

9. Conclusions

The growing development of eSports, and e-football games in particular, is progressively changing the relationship between younger generations, digital technologies, and sports. Within youth football academies, such virtual environments can no longer be interpreted exclusively as forms of recreational entertainment, as they now represent an integral part of the daily, communicative, and cultural experiences of young footballers. In this context, the need to develop pedagogical reflections capable of critically understanding the role of digital technologies in contemporary sports training processes emerges. By analyzing the perspectives of game-based learning, situated learning, and the ecological-dynamic approach, this article highlighted how e-football games can theoretically represent complementary teaching tools to support processes of tactical understanding, decision-making, cognitive reflection, and collaborative learning. The interactive and dynamic characteristics of these virtual environments appear to require young users to continuously observe, anticipate, and adapt their decisions, elements consistent with some of the main cognitive demands present in real football. The possible educational value of e-football games should not be interpreted automatically or deterministically. Virtual experience does not replace the physical activity, perceptual, and relational dimensions of the game played on

the field and does not directly guarantee performance transfer or technical-tactical improvement. On the contrary, the educational contribution of these tools appears strictly dependent on the quality of pedagogical mediation, the methods of methodological integration, and the coach's ability to connect digital experience, critical reflection, and concrete physical activity. From this perspective, the proposed theoretical framework suggests the possibility of integrating e-football games into structured educational paths, in which virtual tactical exposure, guided discussion, field transfer, and reflective feedback can interact in a complementary way. This approach could not only foster the development of tactical awareness and active participation, but also promote digital responsibility, collaboration, and the critical use of technologies in young athletes. Despite these theoretical potential, the scientific literature is still limited in its methodological systematization and empirical evidence regarding the use of e-football games in youth football academies. Consequently, future research should explore in an interdisciplinary manner the relationship between digital environments, soccer learning, and youth cognitive development, experimentally verifying the effectiveness of integrated protocols based on the interaction between virtual experience and real-world sports experience.

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