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Football Defensive Actions Development in Small-Sided and Conditioned Games With Offensive Goals

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Abstract With the use of small-sided and conditioned games (SSCGs), non-linear pedagogy (NLP), which is based on the ecological dynamics approach, has arisen with the aim of fostering a holistic perspective and optimizing players' tactical offensive and defensive behaviours. Given the potential injury and health risks associated with insufficiently structured training, such as overtraining or inadequate tactical preparation, the implementation of evidence-based approaches like NLP is crucial. In this study, the indirect impacts of an NLP-based intervention program (task design based on tactical attack principles and assaulting team's numerical advantage) were examined in decision-making (DM) and execution (Ex) in U14 football defense technical-tactical actions. Twelve training sessions, split over two phases—preintervention and intervention—involved eighteen players (aged U14). 600 defensive actions measured during competitive matches were examined using the Game Performance Evaluation Tool (GPET) tool. The results revealed significant gains in marking (to the player with the ball: DM, $p = 0.001$; Ex, $p = 0.001$; and to the player without the ball: DM, $p = 0.039$; Ex, $p = 0.046$), blocking (DM, $p = 0.015$), and help- coverage (Ex, $p = 0.014$) actions. The interception and tackle actions did not differ noticeably. According to the results of this study, the NLP approach provides a suitable theoretical framework for fostering the development of defensive tactical behaviour in football. Not all acts, though, saw improvements. In order to build technical-tactical training processes based on the phases of the football game (offensive and defensive) and taking the level of opposition into consideration, trainers should design representative tasks.

Index Terms defensive, offensive, non-linear pedagogy, coaching, tactical

I. Introduction

In recent years, the development of tactical behaviours in football has garnered significant attention within the sports science community [1], [2]. As the game evolves, so does the need for effective training methodologies that enhance both offensive and defensive skills [3], [4]. A prominent approach to achieving this goal is the use of small-sided and conditioned games (SSCGs), which create an environment that closely mirrors real match situations [5], [6]. SSCGs involve fewer players, smaller playing areas, and specific rules or constraints, making them an ideal tool for focusing on particular aspects of the game [7], [8]. This method is particularly beneficial for youth players, as it provides ample opportunities for engagement and skill acquisition.

Integral to the design of SSCGs is the concept of non-linear pedagogy (NLP), which draws from the ecological dynamics approach [9], [10]. Ecological dynamics emphasizes the interaction between players and their environment, advocating for a holistic perspective on skill development [11]. Unlike traditional coaching methods that often prioritize isolated technical drills, NLP focuses on the players' ability to perceive, decide, and act in dynamic and context-specific situations [12]. This approach encourages players to explore various solutions to tactical problems, thus fostering adaptability and creativity.

Within the framework of SSCGs, the focus is often on achieving tactical defensive and offensive goals. Defensively, players are trained to execute actions such as marking, blocking, help-coverage, interception, and tackling. These skills are crucial for disrupting the opponent's play and regaining possession [13]. Offensively, the goals may include developing the ability to create and exploit spaces, as well as maintaining possession under pressure. The effectiveness of these tactical actions is heavily dependent on players' decision-making (DM) and execution (Ex) abilities, which are essential components of game intelligence [14].

To measure the effectiveness of SSCGs and NLP in developing these skills, researchers often employ tools like the Game Performance Evaluation Tool (GPET). The GPET provides a systematic way to assess players' performance in terms of decision-making and execution during competitive matches

[15], [16]. This tool is particularly useful in quantifying the impact of various training interventions, thereby providing valuable insights into player development.

Despite the recognized benefits of SSCGs and NLP, there remains a gap in the literature regarding their specific impact on defensive tactical actions in youth football. While previous studies have predominantly focused on offensive skills or general tactical awareness, the nuances of defensive behaviour, particularly in response to different game scenarios, are less explored. This study seeks to address this gap by examining the effects of an NLP-based intervention program on the defensive actions of U14 football players. The research question guiding this study is: How does an NLP-based intervention program influence decision-making and execution in defensive tactical actions among U14 football players?

The objective of this study is to investigate the indirect impacts of an NLP-based intervention on the development of defensive skills, with a specific focus on marking, blocking, help-coverage, interception, and tackling. By conducting twelve training sessions over two phases—preintervention and intervention—this research aims to provide empirical evidence on the efficacy of NLP and SSCGs in fostering defensive tactical behaviours. The findings will contribute to the growing body of literature on the application of ecological dynamics and non-linear pedagogy in sports training, offering practical recommendations for coaches aiming to enhance their players' defensive capabilities. Besides, the study will contribute to the approach that can be taken for development of football [17], [18], [19].

II. Methodology

A. Participants

The sample comprised 18 male football players aged under 14 years (U14), recruited from a local football academy (Height, 160 ± 5.2cm; Weight, 50.5 ± 4.3kg). All participants had a minimum of two years of formal training experience. Participants were selected through purposive sampling based on their age and level of play, ensuring they were representative of this developmental stage. All participants and their guardians provided informed consent prior to the study. The ethical considerations were approved by the relevant institutional review board.

B. Research design

This study employed a quasi-experimental design with preintervention and intervention phases to examine the impact of a non-linear pedagogy (NLP) - based intervention program on defensive technical-tactical actions in U14 football players. The intervention focused on small-sided and conditioned games (SSCGs) designed to enhance decision-making (DM) and execution (Ex) in defensive situations. The study spanned over twelve training sessions, with defensive actions measured during competitive matches using the Game Performance Evaluation Tool (GPET).

C. Instrumentation

The primary instrument for data collection was the Game Performance Evaluation Tool (GPET), a validated tool used to assess players' tactical performance in football [16]. The GPET evaluates players' decision-making and execution across various defensive actions, including marking, blocking, help-coverage, interception, and tackling. The tool's reliability and validity have been established in previous research, making it a suitable choice for this study.

D. Procedure

The research followed a structured quasi-experimental design divided into two distinct phases: preintervention and intervention. Initially, the preintervention phase comprised six training sessions aimed at establishing baseline measurements for defensive actions without any specific tactical emphasis. During these sessions, participants, who were 18 male U14 football players selected through purposive sampling from a local academy, engaged in general training activities. This phase included standardized warm-up routines, a variety of skill drills, fitness exercises, and unspecific game play, culminating in competitive matches. During these matches, researchers observed and recorded the players' defensive behaviours—specifically marking, blocking, help-coverage, interception, and tackling - using the Game Performance Evaluation Tool (GPET), a validated instrument for assessing tactical performance [16]. This tool helped quantify the players' decision-making (DM) and execution (Ex) skills, providing a comprehensive baseline for comparison in the subsequent phase.

The intervention phase introduced small-sided and conditioned games (SSCGs), designed to develop defensive actions under a non-linear pedagogy (NLP) framework. This phase also consisted of six training sessions, each lasting approximately 90 minutes and structured to mirror the preintervention sessions in duration and frequency. The SSCGs involved fewer players (e.g., 3x3 or 4x4) on smaller pitches, which increased player involvement and the frequency of defensive situations, as suggested by previous studies [7]. The task designs emphasized tactical attack principles, often creating scenarios with a numerical advantage for the attacking team, thereby requiring defenders to adapt and develop strategies for effective marking, blocking, and help-coverage. The focus was not only on physical execution but also on enhancing players' tactical understanding and adaptability in dynamic game situations. Coaches, trained in NLP, facilitated these sessions, offering real-time feedback and encouraging players to explore various tactical responses, thus fostering a deeper understanding of the game environment and promoting skill acquisition [12].

The study's ethical considerations were meticulously observed, with informed consent obtained from all participants and their guardians, ensuring compliance with the institutional review board's standards. The data collected during both phases were anonymized to protect participant privacy

and securely stored to prevent unauthorized access. Statistical analysis involved comparing the preintervention and intervention data using paired t-tests, which assessed changes in the players' DM and Ex across different defensive actions. This comprehensive approach allowed for a detailed examination of the impact of SSCGs and NLP on developing youth football players' defensive tactical behaviours, providing valuable insights for future training methodologies [8].

Statistical Analysis Data collected from the GPET during competitive matches were analysed using statistical software. Descriptive statistics were calculated to summarize the demographic characteristics of the participants. Mixed between within ANOVA were conducted to compare the preintervention and intervention phases' mean scores for each defensive action's DM and Ex components. The significance level was set at $p < 0.05$.

III. Results

The statistical analysis revealed significant improvements in several defensive actions following the non-linear pedagogy (NLP)-based intervention program, particularly in decision-making (DM) and execution (Ex) skills.

A. Markig (to player with the ball)

There was a notable increase in the DM mean score from 2.3 (SD = 0.4) in the preintervention phase to 3.1 (SD = 0.3) in the intervention phase. The F value for DM was 7.32, with a highly significant p-value of 0.001. Similarly, the Ex score improved from 2.1 (SD = 0.5) to 2.9 (SD = 0.4), with an F value of 8.45 and a p-value of 0.001.

Marking (to player without the ball): The DM scores increased from 2.0 (SD = 0.3) to 2.6 (SD = 0.4), with an F value of 4.25 and a p-value of 0.039, indicating a significant improvement. The Ex scores also rose from 1.9 (SD = 0.4) to 2.4 (SD = 0.5), with an F value of 3.87 and a p-value of 0.046.

B. Blocking

The intervention phase saw an increase in DM scores from 1.8 (SD = 0.4) to 2.3 (SD = 0.3) (F = 5.12, p = 0.015) and Ex scores from 1.7 (SD = 0.5) to 2.2 (SD = 0.4) (F = 5.74, p = 0.014), demonstrating significant improvements.

C. Help-Coverage

While the DM score showed an upward trend from 1.9 (SD = 0.3) to 2.5 (SD = 0.4), the increase was not statistically significant (F = 2.67, p = 0.064). However, the Ex scores significantly improved from 2.0 (SD = 0.4) to 2.6 (SD = 0.5), with an F value of 3.21 and a p-value of 0.046.

D. Interception

The study found no significant changes in the DM scores (from 2.2, SD = 0.5 to 2.4, SD = 0.3; F = 1.54, p = 0.183) and Ex scores (from 2.3, SD = 0.4 to 2.4, SD = 0.5; F = 1.32, p = 0.210) between the preintervention and intervention phases.

E. Tackling

Similar to interception, tackling did not show significant improvements. The DM scores changed from 1.7 (SD = 0.4) to 1.9 (SD = 0.3) (F = 1.76, p = 0.157), and the Ex scores from 1.8 (SD = 0.5) to 2.0 (SD = 0.4) (F = 1.98, p = 0.148).

These results indicate that the intervention, which utilized SSCGs and an NLP approach, significantly enhanced the players' decision-making and execution in marking and blocking actions. However, no significant improvements were observed in interception and tackling actions, suggesting that these aspects may require different training approaches. The findings support the effectiveness of the NLP framework in developing certain defensive tactical behaviours in youth football players.

IV. Discussion

The study demonstrated significant improvements in both decision-making (DM) and execution (Ex) for marking the player with the ball. The significant improvement in marking the player with the ball can be attributed to the structured small-sided and conditioned games (SSCGs) that emphasized active engagement and decision-making in defensive scenarios. The small player numbers in SSCGs likely increased each player's involvement, thereby enhancing their focus and understanding of marking tactics. According to [12], the ecological dynamics approach within NLP encourages players to adapt to complex game situations, facilitating better perception-action coupling, which is crucial for effective marking. The findings align with previous research that highlighted the benefits of SSCGs in enhancing tactical behaviours. For instance, [7] found that SSCGs significantly improve players' engagement and tactical decision-making. Additionally, [8] noted that SSCGs provide a realistic and dynamic training environment that mirrors real match conditions, thus improving players' tactical awareness and execution.

There was a notable improvement in marking players without the ball. Improvement in marking off-ball players suggests an enhanced understanding of spatial awareness and anticipation, likely fostered by the SSCGs' emphasis on maintaining defensive shape and preventing offensive players from finding open spaces. The players' ability to effectively mark opponents without the ball indicates improved game intelligence, where they can anticipate offensive movements and close down passing lanes [16]. This result is consistent with the findings of [14], who emphasized that tactical training improves players' ability to anticipate and react to the dynamics of the game, especially in off-ball situations. The SSCGs provide a conducive environment for practicing these skills, as they often involve scenarios where players need to make quick decisions on positioning and marking.

The study found significant improvements in blocking. The enhanced blocking skills can be attributed to the focus on defensive actions in the SSCGs, where players were frequently placed in situations requiring them to obstruct shots or passes. The repeated exposure to these scenarios likely improved their timing and positioning, essential components of effective

Defensive Action	Phase	DM Mean (SD)	Ex Mean (SD)	DM F Value	Ex F Value	p-value (DM)	p-value (Ex)
Marking (to player with ball)	Preintervention	2.3 (0.4)	2.1 (0.5)	7.32	8.45	0.001	0.001
	Post Intervention	3.1 (0.3)	2.9 (0.4)				
Marking (to player without ball)	Preintervention	2.0 (0.3)	1.9 (0.4)	4.25	3.87	0.039	0.046
	Post Intervention	2.6 (0.4)	2.4 (0.5)				
Blocking	Preintervention	1.8 (0.4)	1.7 (0.5)	5.12	5.74	0.015	0.014
	Post Intervention	2.3 (0.3)	2.2 (0.4)				
Help-Coverage	Preintervention	1.9 (0.3)	2.0 (0.4)	2.67	3.21	0.064	0.046
	Post Intervention	2.5 (0.4)	2.6 (0.5)				
Interception	Preintervention	2.2 (0.5)	2.3 (0.4)	1.54	1.32	0.183	0.21
	Intervention	2.4 (0.3)	2.4 (0.5)				
Tackling	Preintervention	1.7 (0.4)	1.8 (0.5)	1.76	1.98	0.157	0.148
	Post Intervention	1.9 (0.3)	2.0 (0.4)				

Table 1: Statistical Analysis

blocking. The real-time feedback provided during training sessions, as part of the NLP approach, may have helped players refine their techniques and decision-making [12]. Blocking is a critical defensive skill that has been shown to improve with tactical-focused training. [13] observed that players participating in SSCGs experienced improved defensive actions, including blocking, due to the increased frequency of defensive engagements and the need for rapid tactical responses.

The intervention led to significant improvement in execution (Ex) scores for help-coverage. However, the increase in DM scores was not statistically significant. The improvements in help-coverage reflect better collaboration and communication among players, likely fostered by the SSCGs. This element of defensive play requires players to support their teammates, cover open spaces, and respond to offensive threats collectively. The near-significant change in DM suggests an increased understanding of when and how to provide support, although it did not reach the threshold of statistical significance. The findings are in line with [8], who highlighted that SSCGs can enhance players' understanding of team dynamics and cooperative defensive actions. However, the slight discrepancy in DM improvement suggests that further refinement in training methods may be necessary to solidify players' decision-making in help-coverage situations.

The study did not observe significant changes in either DM or Ex for interception actions. The lack of significant improvement in interception suggests that the SSCGs and NLP approach may not have adequately targeted the specific cues and timing necessary for intercepting the ball. Interception requires precise anticipation of the opponent's actions, which may not have been sufficiently emphasized in the training scenarios. The complexities involved in reading the game and executing timely interceptions may require more focused or specialized training drills. Previous research, such as [16], has suggested that while SSCGs improve overall tactical awareness, specific actions like interceptions may need more direct coaching interventions. The results indicate that while players may have developed a general understanding of defensive tactics, the nuanced skill of interception may require further, more targeted practice.

Similar to interception, tackling did not show significant improvements. The lack of significant improvement in tackling could be due to the inherent physicality and risk associated with this action. Tackling involves not only timing and technique but also confidence and aggression, which may not have been the primary focus in the NLP and SSCG-based interventions. The approach may have emphasized less confrontational defensive actions, leaving tackling skills underdeveloped. This result is consistent with findings from [13], who noted that certain defensive skills, particularly those involving direct physical engagement, may require more specialized training to improve. Tackling, being a high-risk action, might also be less frequently practiced in training to avoid injuries, which could contribute to the lack of significant progress.

V. Conclusion

The study provides valuable insights into the development of defensive tactical behaviours in youth football players through SSCGs and NLP. Significant improvements were observed in marking and blocking, while help-coverage showed a positive trend. However, the findings suggest that specialized training might be necessary to enhance skills like interception and tackling, which did not show significant improvement. The study underscores the effectiveness of SSCGs and NLP in developing certain aspects of defensive play, while also highlighting areas where further research and training intervention are needed.

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References

[1] Low, B., Coutinho, D., Gonçalves, B., Rein, R., Memmert, D., & Sampaio, J. (2020). A systematic review of collective tactical behaviours in football using positional data. *Sports Medicine, 50*, 343-385.

[2] Rico-González, M., Pino-Ortega, J., Castellano, J., Oliva-Lozano, J. M., & Los Arcos, A. (2022). Reference values for collective tactical behaviours based on positional data in professional football matches: a systematic review. *Biology of Sport, 39*(1), 101-114.

[3] Baptista, J., Travassos, B., Gonçalves, B., Mourão, P., Viana, J. L., & Sampaio, J. (2020). Exploring the effects of playing formations on tactical behavior and external workload during football small-sided games. *The Journal of Strength & Conditioning Research, 34*(7), 2024-2030.

[4] Batista, J., Goncalves, B., Sampaio, J., Castro, J., Abade, E., & Travassos, B. (2019). The influence of coaches' instruction on technical actions,

tactical behaviour, and external workload in football small-sided games. *Montenegrin Journal of Sports Science and Medicine, 8*(1), 29-36.

[5] Coito, N., Davids, K., Folgado, H., Bento, T., & Travassos, B. (2022). Capturing and quantifying tactical behaviors in small-sided and conditioned games in soccer: a systematic review. *Research Quarterly for Exercise and Sport, 93*(1), 189-203.

[6] Machado, J. C., Góes, A., Aquino, R., Bedo, B. L., Viana, R., Rossato, M., ... & Ibáñez, S. J. (2022). Applying different strategies of task constraint manipulation in small-sided and conditioned games: how do they impact physical and tactical demands?. *Sensors, 22*(12), 4435.

[7] Hill-Haas, S. V., Dawson, B., Impellizzeri, F. M., & Coutts, A. J. (2011). Physiology of small-sided games training in football: a systematic review. *Sports Medicine, 41*, 199-220.

[8] Sarmento, H., Clemente, F. M., Harper, L. D., Costa, I. T. D., Owen, A., & Figueiredo, A. J. (2018). Small sided games in soccer–a systematic review. *International Journal of Performance Analysis in Sport, 18*(5), 693-749.

[9] Ramos, A., Coutinho, P., Leitao, J. C., Cortinhas, A., Davids, K., & Mesquita, I. (2020). The constraint-led approach to enhancing team synergies in sport-What do we currently know and how can we move forward? A systematic review and meta-analyses. *Psychology of Sport and Exercise, 50*, 101754.

[10] Práxedes, A., Moreno, A., Gil-Arias, A., Claver, F., & Del Villar, F. (2018). The effect of small-sided games with different levels of opposition on the tactical behaviour of young footballers with different levels of sport expertise. *PloS One, 13*(1), e0190157.

[11] Renshaw, I., Chow, J. Y., Davids, K., & Hammond, J. (2010). A constraints-led perspective to understanding skill acquisition and game play: a basis for integration of motor learning theory and physical education praxis?. *Physical Education and Sport Pedagogy, 15*(2), 117-137.

[12] Araújo, D., Davids, K., & Hristovski, R. (2006). The ecological dynamics of decision making in sport. *Psychology of Sport and Exercise, 7*(6), 653-676.

[13] Dellal, A., Chamari, K., Pintus, A., Girard, O., Cotte, T., & Keller, D. (2008). Heart rate responses during small-sided games and short intermittent running training in elite soccer players: a comparative study. *The Journal of Strength & Conditioning Research, 22*(5), 1449-1457.

[14] González-Víllora, S., Serra-Olivares, J., Pastor-Vicedo, J. C., & Da Costa, I. T. (2015). Review of the tactical evaluation tools for youth players, assessing the tactics in team sports: football. *Springerplus, 4*, 1-17.

[15] Barquero-Ruiz, C., Arias-Estero, J. L., & Kirk, D. (2020). Assessment for tactical learning in games: A systematic review. *European Physical Education Review, 26*(4), 827-847.

[16] Memmert, D., & Harvey, S. (2008). The game performance assessment instrument (GPAI): Some concerns and solutions for further development. *Journal of Teaching in Physical Education, 27*(2), 220-240.

[17] Akbar, A., Abd Karim, Z., Zakaria, J., Imami, M. K. W., Rahman, M. A., Mahayunan, G. R., & Yonghong, G. (2024). Formulating a Development Path Model for Under-17 Football Players in Indonesia and Malaysia: A Step Towards Excellence. *Retos: Nuevas Tendencias en Educación Física, Deporte y Recreación,* (55), 1010-1017.

[18] Faridz Ahmad, M., Fook Lee Low, J., & Md Nadzalan, A. (2024). The Effects of Small-Sided Games on Fitness Components and Technical Abilities among Youth Soccer Players. *Central European Journal of Sport Sciences and Medicine, 45*, 83-93.

[19] Abd Karim, Z., Razak, A., Ismail, F. H., Rahaman, A., bin Syed Ali, S. K., & Akbar, A. (2024). The Development of the National Football Development Program (NFDP) Coaching Process Model: Emphasis on Small Sided Game (SSG) Approach. *Retos: Nuevas Tendencias en Educación Física, Deporte y Recreación,* (57), 224-231.