



## Gaelic Football Coaches' Use of a Game-Based Approach Impacts Game Performance, Session Characteristics, and Player Perceptions

Paul Kinnerk, Philip E. Kearney, Stephen Harvey & Mark Lyons

To cite this article: Paul Kinnerk, Philip E. Kearney, Stephen Harvey & Mark Lyons (2025) Gaelic Football Coaches' Use of a Game-Based Approach Impacts Game Performance, Session Characteristics, and Player Perceptions, Research Quarterly for Exercise and Sport, 96:4, 732-747, DOI: [10.1080/02701367.2025.2496263](https://doi.org/10.1080/02701367.2025.2496263)

To link to this article: <https://doi.org/10.1080/02701367.2025.2496263>



© 2025 The Author(s). Published with license by Taylor & Francis Group, LLC.



[View supplementary material](#)



Published online: 19 May 2025.



[Submit your article to this journal](#)



Article views: 4635



[View related articles](#)







[View Crossmark data](#)



Citing articles: 1 [View citing articles](#)

## Gaelic Football Coaches' Use of a Game-Based Approach Impacts Game Performance, Session Characteristics, and Player Perceptions

Paul Kinnerk <sup>a</sup>, Philip E. Kearney <sup>a</sup>, Stephen Harvey <sup>b</sup>, and Mark Lyons <sup>a</sup>

<sup>a</sup>University of Limerick; <sup>b</sup>Ohio University

### ABSTRACT

This study investigated the impact of a Game-Based Approach (GBA) intervention on practice session characteristics, player performance outcomes, and perceptions within Gaelic football. Employing a mixed-methods multiple baseline design, two squads (Under 14 and Under 15) from a Gaelic football academy underwent the intervention, one after 4 weeks and the other after 9 weeks of baseline. Framed by Complex Learning Theory (CLT), the intervention comprised systematic observations of coaching sessions, quantitative assessment of skill execution and decision-making in assessment games, and qualitative interviews and focus groups with players. The GBA intervention positively influenced practice session characteristics, promoting playing form and non-linear sequencing of activities. The evaluation of players' game performance showed significant improvement across all decision-making variables for both squads. In skill execution, there was limited support, with improvements observed only in the Under 14 squad. Systematic tracking of practice activity sequencing, supported by player data, revealed players' awareness of purposeful organization, with the explicit connection between tasks fostering knowledge development and reflection, potentially enhancing decision-making. While players appreciated conditioned games and the tactical curriculum, they were less receptive to the player-centered strategy of "player huddles." The comprehensive data collection approach of this study fills gaps in sports coaching research, offering insights into the design and efficacy of GBA interventions. GBA interventions are suggested to enhance player performance and session quality, providing guidance for coaches in optimizing training methodologies. Integration of GBA pedagogy with CLT offers a promising framework for coaches seeking tangible changes in their practice.

### ARTICLE HISTORY



Received 14 June 2024  
Accepted 17 April 2025


### KEYWORDS

Coaching; decision-making;  
game-based approaches;  
skill execution

Displaying high levels of decision-making and skill execution is critical for successful performance in invasion game sports (Abad Robles et al., 2020). Players need to be able to execute technically appropriate movement patterns, but they also need to understand how such movement patterns are adapted to meet the game context (i.e., skill) (Light, 2013). Game-Based Approaches (GBAs) were developed to address such needs by prioritizing the meaningful learning of decision-making in games, instead of coaching systematic techniques that are not contextualized in the game (Bunker & Thorpe, 1982). Thus, in GBAs, there is no separation between technical skill, tactical knowledge and decision-making as they all inform each other (Light, 2013). Session characteristics (e.g., practice activities, sequence of activities, and utilization of inactivity periods) and pedagogical techniques (e.g., use of questioning/discussion) are key features in the implementation of GBAs. GBAs are based on the assumption that they allow players to improve their performance based on improvements in decision-making and skill execution (Bunker & Thorpe, 1982). While a number of in-situ interventions in coaching settings have investigated this assumption (e.g., Miller et al., 2016), there is, generally, a dearth of intervention-based studies in coaching settings to support such claims (Kinnerk et al., 2018; Manninen et al., 2024; Morales-Belando et al., 2022; Richardson et al., 2024).

GBAs are drawn from constructivist principles. While there are many forms of constructivist theories (for an overview see Light & Clarke, 2021), Complex Learning Theory (CLT) has been specifically proposed to guide practitioners in the use of GBAs (Light, 2008; Light & Clarke, 2021). Researchers within the CLT framework posit that learning is a dynamic, emergent process shaped by the interaction of individuals within their environment, emphasizing the importance of context and experience in knowledge construction (Light & Harvey, 2015). They also highlight that learning is non-linear and evolves through adaptive problem-solving and exploration in authentic scenarios, such as modified game situations that mirror real match challenges (Light & Clarke, 2021). CLT integrates three core elements of constructivism: (i) learning is active, (ii) learning is social, and (iii) learning is interpretative; these elements emphasize that learning occurs through engaging, interactive, and context-based experiences (Light, 2013). CLT's holistic approach supports GBA pedagogy by centering learning within the game as a whole, rather than isolating skills, techniques, or tactics (Cushion, 2013). CLT's framework has subsequently informed research into coaches' planning (Kinnerk et al., 2023) and in-session core coaching practices (Kinnerk et al., 2024). Accordingly, CLT's three-element framework is well positioned to enhance

**CONTACT** Paul Kinnerk  [Paul.Kinnerk@ul.ie](mailto:Paul.Kinnerk@ul.ie)  Department of Physical Education and Sports Sciences, University of Limerick, Limerick V94T9PX, Ireland.

 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/02701367.2025.2496263>

© 2025 The Author(s). Published with license by Taylor & Francis Group, LLC.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

understanding of how GBA session characteristics and pedagogical techniques can be effectively applied. This framework also supports insight into performance outcomes, particularly decision-making and skill execution, allowing a deeper exploration of GBA's potential in player development.

The first core element, "learning is active," connects with the GBA session characteristic of practice activities. GBAs propose the employment of game-related activity as the primary activity type within coaching sessions (Bunker & Thorpe, 1982; Light, 2013). Game-related activity is also referred to as playing form and typically includes activities such as phases of play, conditioned games, and small-sided games (e.g., Ford et al., 2010; Harvey et al., 2013). To develop decision-making and technical skills for the demands of match-play in invasion game sports, research recommends that players spend greater time in playing form activities (Deuker et al., 2024). However, simply involving players in game-related activities does not guarantee performance improvement (Kinnerk et al., 2018). Effective guidance through game design elements (e.g., conditions/rules) and the pedagogical principles of sampling (i.e., exposing players to a variety of game forms to develop transferable tactical understanding and decision-making skills across contexts), tactical complexity (i.e., designing tasks developmentally appropriate to the player's level), modification representation and modification exaggeration is essential to support learning (Cushion, 2013). Among these pedagogical principles, modification representation and modification exaggeration are particularly relevant, as they guide coaches in effectively structuring realistic yet developmentally appropriate activities.

Modification representation enables coaches to design small-sided or conditioned games that scale down complexity while preserving the key tactical structures and decision-making dynamics of full-sided play. This approach ensures that players engage in realistic decision-making scenarios within a more controlled environment (Light, 2013). For example, in Gaelic football, an 8v6 conditioned game can be used to emphasize spatial awareness and tactical positioning during a transition attack while still preserving the fundamental patterns of play from the 15v15 full-sided game. Meanwhile, modification exaggeration involves altering game rules or conditions to highlight specific tactical and technical objectives, such as restricting plays in the middle zone to promote "support play" and "changing the point of attack." This purposeful approach to game design aligns with CLT's principle that "learning is active" by engaging players in meaningful problem-solving within dynamic and representative practice environments, encouraging them to construct meaning from guiding information through active involvement in practice activities (Light et al., 2014). In addition, tactical themes and principles of play actively guide session and season planning in GBAs, engaging players in hands-on exploration and application of key tactical concepts (Morales-Belando & Arias-Estero, 2017; Ribeiro et al., 2019). This approach aligns with the "learning is active" element of CLT, as players are not merely receiving information but are actively involved in understanding and interpreting tactical principles in game-like situations (Mitchell et al., 2013). By developing curricula that emphasize these tactical elements, coaches create

opportunities for players to actively practice and adapt critical aspects of gameplay, thereby enhancing their tactical awareness and readiness for successful performance (Morales-Belando & Arias-Estero, 2017).

The second element, "learning is social," is evident in how GBAs promote interactions that can occur both during active play and within the significant periods when players are not physically active (O'Connor et al., 2018). During these periods, players are engaged in water breaks, transitioning from activities, and in coach-player huddles. Few studies have captured the amount of time players spend in these periods referred to as "inactivity" or "other" (Harvey et al., 2013; O'Connor et al., 2018). GBA pedagogy proposes using these periods for learning by applying questioning and enabling players to discuss and debate ideas (Kinnerk et al., 2024; Light, 2013). Importantly, questioning and reflective dialogue can also occur during activities, such as in brief pauses or "freeze" moments, further embedding opportunities for critical thinking and reflection directly within the flow of practice (Kinnerk et al., 2024). Evidence indicates that structured questioning and peer discussions deepen tactical and technical understanding by encouraging critical reflection, collaborative problem-solving, and co-construction of knowledge (Kinnerk et al., 2024; Práxedes et al., 2016). For instance, coach-facilitated structured peer discussions and questioning provide players with opportunities to verbalize their thought processes, negotiate strategies, and refine their tactical awareness through guided interaction, reinforcing their decision-making skills (Barquero-Ruiz & Kirk, 2024; Kinnerk et al., 2024; Light & Harvey, 2015). Furthermore, these social interactions foster a sense of belonging, responsibility, and mutual respect, which positively influence motivation and participant perceptions (Evans & Light, 2007; Light & Clarke, 2021; Thomas et al., 2013). By structuring these interactions, GBA aligns with CLT's emphasis on the social dimensions of learning, recognizing that knowledge is co-constructed in social settings and that collaborative environments enhance both learning outcomes and the participant experience (Barquero-Ruiz & Kirk, 2024; Light, 2008).

The third element, "learning is interpretative," aligns with the session characteristic of sequencing, which involves designing practice tasks in a purposeful order to help players make meaningful connections between activities (Kinnerk et al., 2023). In GBAs, sequencing begins with an initial game form to frame the session, followed by interconnected tasks that either simplify or build on the concepts embedded in the game form (Metzler, 2017; Pill, 2016). For example, a session might start with a small-sided game to introduce a tactical principle, then progress to zonal restrictions emphasizing spatial awareness, and conclude with a full-game scenario to integrate learning (Kinnerk et al., 2023; Light, 2013). Sequencing also incorporates scaffolding, where the coach adjusts task complexity and support based on players' skill levels, gradually transferring responsibility to players to make independent decisions (Van de Pol et al., 2010). For instance, early tasks may include explicit conditions like limiting passes to highlight patterns of play, with restrictions eased as players gain confidence and autonomy (Light, 2013; Ramos et al., 2021; Rink, 2020). Dialogue between players and coaches

further enhances learning by encouraging reflection on task sequencing and its rationale, fostering critical thinking and interpretation (Butler, 2014; Stolz & Pill, 2014). Skill execution in GBAs is deeply connected to the interpretative process, as players analyze the game context, interpret its demands, and select the most appropriate skill to address the situation (Light, 2013). Informed by earlier tasks in the sequence, players draw on prior interpretations to refine their responses, dynamically adapting their technical and tactical execution to meet the evolving demands of the game (Morales-Belando & Arias-Estero, 2017; Rink, 2020). While research suggests sequencing is often underutilized by coaches due to a lack of clear guidelines (Kinnerk et al., 2023), incorporating structured sequencing can improve player outcomes by ensuring tasks build on prior knowledge, enabling the refinement of technical execution and tactical awareness in alignment with CLT's view of learning as interpretative and iterative (Light, 2008).

Despite the growing popularity of GBAs, significant research gaps remain, particularly concerning the practical implementation and assessment of GBAs in coaching contexts. Assessment in invasion games should prioritize evaluating players' game performance in context, focusing on decision-making and skill execution as integrated aspects of play (Barquero-Ruiz et al., 2020, 2024; Gréhaigne et al., 2005). Although various tools in GBA research measure these aspects, few have been applied in coaching, and no definitive standard has been established (Barquero-Ruiz et al., 2020; Kinnerk et al., 2018; Manninen et al., 2024). The limited studies on coaching contexts show improvements in players' decision-making but less significant advancements in technical skills, a finding which some authors have linked to a need for more sophisticated assessment tools in sports coaching (Kinnerk et al., 2018; Manninen et al., 2024). Reviews of GBA research have called for future studies to include such assessment instruments within study designs (Kinnerk et al., 2018; Manninen et al., 2024; Miller, 2015). The Game Play Observational Instrument (GPOI) is one such instrument that has only featured in one coaching study to date (Nathan, 2015). The GPOI measures three critical aspects of a player's in-possession performance in invasion game sports, such as Gaelic football: gaining control of the ball, decision-making and skill execution. Critically, GPOI enables these key performance measures to be gathered within the context of the game, aligning with CLT by capturing the interconnected and dynamic nature of learning as it unfolds in real-time play. Supplementing instruments such as the GPOI with players' perceptions of GBA interventions is vital, as understanding their experiences can aid the interpretation of quantitative results and ultimately improve coaching practices (Harvey, 2009). However, limited studies have explored the impact of GBA on players' experiences, with mixed findings on performance, enjoyment, and adaptation challenges (Evans & Light, 2007; Koekoek et al., 2014; Thomas et al., 2013). Even fewer studies have explicitly linked player performance data with qualitative perception data, emphasizing a need for mixed-methods approaches to provide a more nuanced understanding of GBA impacts (Morales-Belando & Arias-Estero, 2017).

Research on the adoption of GBAs in coaching remains limited, partly due to a lack of in-situ intervention studies that assess critical outcomes like decision-making and skill execution (Lyle, 2018), and link these outcomes to changes in coaches' session design and delivery. Although some studies document GBA intervention effects on player performance, they often lack data on specific session characteristics such as practice sequencing and player inactivity, which could enhance our understanding of intervention effectiveness (Harvey et al., 2010; Morales-Belando & Arias-Estero, 2017). Recent reviews emphasize the need for GBA research to encompass diverse sports, geographical areas, and coaching contexts, addressing gaps in GBA's practical adoption and impact on coaching methodologies (Kinnerk et al., 2018; Manninen et al., 2024). Building on these foundations, the purpose of the current study is to explore the effects of a GBA intervention on decision-making and skill execution in Gaelic football while also examining players' perceptions and session characteristics (i.e., practice activities, inactivity, and sequencing) to provide a nuanced understanding of GBA impacts.

## Method

### Design

This study employed a convergent parallel mixed-methods multiple baseline design (Creswell & Plano Clark, 2018). This design involves collecting qualitative and quantitative data concurrently, analyzing each dataset separately, and merging the results for interpretation. The multiple baseline aspect of the design (Kazdin, 2021) was implemented by introducing the GBA intervention to two squads at staggered intervals: one squad received the intervention after a four-week baseline period, while the other received it after a nine-week baseline.

### Setting

The two squads involved in this study were part of their county's Gaelic football academy; the academy was established as a pathway to nurture the best underage talent in the county from Under 14 to Under 18. Gaelic football is an invasion game and is the most popular sport in Ireland (Sport Ireland, 2015). The best club players are selected to be part of the academy and represent their respective age group at inter-county level. Inter-county is the highest grade a player can play at within their specific age group in Gaelic football.

### Participants

Participants were recruited from boys U14 ( $n = 38$ ), and U15 ( $n = 38$ ) inter-county Gaelic football academy.<sup>1</sup> Most players on the U15 team had one-year experience in the academy. U14 players' previous experience was with their club and school. Participant inclusion criteria were: (a) present for 80% of coaching sessions throughout the season and (b) present for at least three of the four baseline testing sessions and present for at least one of the two posttest testing sessions. 23 players

<sup>1</sup>Players train with their inter-county academy team once per week and may also train with their club team.

from the U14 squad and 27 from the U15 squad met the requirements and were included in the analysis.

Six coaches (U14,  $n = 3$ ; U15,  $n = 3$ ) were initially recruited for the study. One U14 team coach was unable to complete the study due to personal circumstances, meaning five coaches completed the study. All coaches held foundation-level gaelic games coaching accreditation but had little prior knowledge of GBA pedagogy. However, all three U15 coaches were teachers, and one U14 coach was also a teacher, indicating they may have possessed general pedagogical knowledge in areas, such as scaffolding, questioning, and environment management. The five coaches had been coaching <5 years and had received no prior teaching or experience of GBAs.

This study was approved by the Education and Health Sciences Research Ethics Committee at the University of Limerick (2017\_10\_03\_EHS). Details of the study were presented to players, their parents and coaches at an information evening in advance of the study. Participants, their parents, and the coaches completed written informed consent forms prior to study commencement.

## Procedures

### Training coaches to use GBAs

No specific GBA model was used in this study. Although closely aligned with Game Sense, the intervention was explicitly based on the four core principles of GBAs as described by Light (2013): (1) the design and manipulation of practice games and activities, (2) the use of questioning, (3) the provision of opportunities for dialogue, and (4) building a supportive sociomoral environment. The lead author, experienced in GBAs and an academic researcher, acted as a “sport pedagogue” to aid coaches in adopting GBA pedagogy. Prior to GBA implementation, four 2-h meetings were held with each set of coaches. Meeting one introduced GBAs, covered relevant

literature, explained the theory, outlined a typical GBA session, and discussed benchmarking. Meeting two focused on developing practice activities aligned with GBA objectives, including various game formats and pedagogical principles. Meeting three emphasized expected coach behaviors during GBA sessions, particularly questioning techniques. The final meeting reviewed a pilot GBA session and involved designing a season plan and the first GBA session. Additionally, a 54-page coach intervention pack was provided, offering sample session plans, tactical themes, behavioral guidelines, planning processes, benchmarks, and reflective diary guidelines. Finally, the sports pedagogue was present at every practice session throughout the season and group meetings were held immediately prior to and after intervention sessions to clarify, review and offer feedback on session plans and implementation. Due to logistical constraints, coach training occurred during the baseline period; however, steps were taken to minimize its impact. Specifically, coaches were instructed not to implement GBA principles until the intervention began, and their practices were monitored to ensure compliance during this time.

### Design of the intervention sessions

In collaboration with the sports pedagogue, the coaches identified tactical themes deemed critical to performance and relative to the assessment game players would be performing in. Themes highlighted by Mitchell et al. (2013) facilitated and guided this process. Following this, coaches in collaboration with the sports pedagogue, developed a schedule of coaching sessions linked to tactical themes for the duration of the GBA intervention (see Table 1). Coaches also identified tactical principles, which were solutions designed to achieve success within a given tactical problem (for example, see Supplement 4). This alignment between session focus and tactical principles aimed to create a coherent structure for player development throughout the season (Mitchell et al.,

**Table 1.** Intervention season schedule.

Week number (sessions)	U14 Squad		U15 Squad	
	Session focus	Intervention detail	Session focus	Intervention detail
1	Pre-intervention session	Baseline test 1	Pre-intervention session	Baseline test 1; Coach GBA training
2	Pre-intervention session	Baseline test 2	Pre-intervention session	Baseline test 2; Coach GBA training
3	Pre-intervention session	Baseline test 3	Pre-intervention session	Baseline test 3; Coach GBA training
4	Pre-intervention session	Baseline test 4	Pre-intervention session	Baseline test 4; Coach GBA training
5	Pre-intervention session		Keeping possession	GBA intervention commences
6	Pre-intervention session	Coach GBA training	Keeping possession	
7	Pre-intervention session	Coach GBA training	Support play	
8	Pre-intervention session	Coach GBA training	Support play	
9	Pre-intervention session	Coach GBA training	Defensive principles	
10	Keeping possession	GBA intervention commences	Defensive principles	
11	Keeping possession		Attack the goal	
12	Defensive principles		Attack the goal	
13	Support play		Transition defence –attack	
14	Support play		Transition defence –attack	
15	Attacking for points		Keeping possession	
16	Attacking for goals & points		Working a point	
17	Attacking for points		Set pieces	
18	Set pieces and breaking ball		Support play	
19	Set pieces and breaking ball		Creating space in attack	
20	Transition play		Set piece	
21	Defending the scoring zone	Post-test 1	Transition defence –attack	
22	No training	Post-test 2	Keeping possession	Post-test 1
23	No training		No training	Post-test 2

2013). The schedule of themes coaches planned for was reviewed on a regular basis, and changes were made according to the team's progress.

Under the sports pedagogue's guidance, coaches tailored coaching sessions for U14 ( $n = 12$ ) and U15 ( $n = 18$ ) squads to Light's (2013) GBA principles and specific tactical themes. Sessions followed a format akin to Light (2013) and Mitchell et al. (2013), featuring:

- (1) Initial game form setting the session's focus.
- (2) Player/coach huddles for questions and new challenges.
- (3) Modified game activities targeting tactical improvements.
- (4) Skills practice if needed to address performance gaps.
- (5) Progressive game forms increasing task complexity.
- (6) Return to initial or different game forms emphasizing session concepts.
- (7) Session review summarizing tactical concepts addressed.

The seven-part sequence was employed as a flexible guide to assist coaches, allowing them to adapt, interchange, or add elements based on the specific needs of their sessions and the context of their players. During the intervention, coaches utilized a questioning strategy designed to promote decision-making and tactical awareness within game situations. Questions were structured not only to encourage reflection (e.g., "What do you think you did well?"), but also to evoke responses that required players to process and make decisions in specific game contexts (e.g., "What options did you have when you received the ball in that situation?" or "How could you create more space for your teammates?"). A sample session plan, along with examples of the questions planned by coaches, can be found in Supplementary File 4. These examples illustrate how questioning was integrated into the sessions to align with the principles of the GBA.

The U15 group began GBA sessions in week 5 after 4 weeks of regular coaching, while the U14 group started in week 10 following 9 weeks of typical coaching. Such staggered baselines are a deliberate feature of multiple baseline designs as they increase confidence that observed changes are due to intervention (Kazdin, 2021). However, these variations in intervention timing and duration also accommodated academic scheduling needs, reflecting real-world conditions where program delivery may vary across groups. As a newly assembled team in their first academy year, the U14 group were given additional time to acclimate before starting the intervention, reducing early pressure on both players and coaches. Given the coaches' additional requirements for children's safeguarding and academy policy training in the initial weeks, adding intervention-specific education at this stage would not have been possible.

Over the 23-week season, the U15 team completed 18 GBA sessions and the U14 team completed 12 GBA sessions. Week 23 was used only for posttest assessment games; therefore, squads did not train this week. Testing occurred before training sessions, except in the final week, when only testing took place. Standardization promoted

data integrity, including uniform training locations and consistent data collection procedures regardless of intervention stage.

#### **Validation of coaches' use of GBA**

To ensure adherence to GBA principles, several steps were taken. A Research Assistant (RA) was recruited to independently observe and record each practice session. Using Turner and Martinek's (1999) validation protocol, the RA coded sessions based on criteria like game-related activities and tactical instruction. Results showed valid GBA implementation in all sessions. Inter-observer reliability was ensured through weekly reviews by the sports pedagogue, achieving a 100% agreement. The RA, trained similarly to coaches, conducted validation processes and gathered field notes independently. Feedback was provided to coaches during and after sessions, with reminders and prompts for GBA methods. A "Whatsapp" group facilitated ongoing dialogue among coaches and the sports pedagogue, with session plans shared for feedback. Over time, the sports pedagogue gradually reduced guidance, allowing coaches to internalize GBA principles independently.

#### **Data collection**

Data were collected in this study in relation to: (a) session characteristics, (b) players' game performance, and (c) players' perceptions. Details relating to each measure are now outlined. The specific order of session characteristics, players' game performance, and players' perceptions is retained in the subsequent data analysis and results sections.

#### **Session characteristics**

Coaching session structure was assessed using a coding system derived from prior coaching studies (Kinnerk et al., 2019; O'Connor et al., 2018). Initially, definitions from this prior research established a coding system, later refined through an expert panel review to ensure content validity. A number of iterations were completed following pilot testing and expert panel feedback before finalizing the adapted coding system. The final coding system, used across 43 practice sessions (U14,  $n = 21$ ; U15,  $n = 22$ ), differentiated between training and playing form activities, as well as periods of inactivity (see Table 2).

The RA conducted data collection and data analysis using the session coding instrument throughout the study. RA received extensive training and conducted intra- and inter-observer reliability checks, ensuring high agreement levels. Intra-observer reliability ranged from 96% to 98.9%, while interrater reliability ranged from 92.2% to 96.6%, surpassing acceptable levels outlined in the literature (McKenzie & Van Der Mars, 2015).

#### **Players' game performance – assessment game and assessment instrument**

**Assessment game for game performance.** A modified 6v6 game, including two goalkeepers, was devised on a 40 m by 30 m area with portable Gaelic football goals (4.57 m × 2.13 m) to evaluate intervention effects on game performance. The

**Table 2.** Practice session coding terms and definitions.

Activity	Definition
<b>Training form</b>	
Drills	Exercises practiced unopposed in lines that require the repetition of skills and prescribed directional movement
Skills in isolation	Similar to drills but don't occur in lines/use of cones and are often completed with little movement/no pressure thus allowing the player to solely concentrate on the skill being practiced (e.g., random practice exercises such as three players kick passing to each other randomly throughout field with no pressure)
Fitness	Exercises completed without the ball that usually focuses on improving fitness, speed and agility etc. (e.g., warm-up/cool down non-ball exercises, stretching, timed runs, conditioning)
<b>Playing form</b>	
Applied skills practice	Activities that involve some level of opposition and where technique is exposed to pressure and elements of decision-making are required. Typically uneven or low number activities (1vs1/2vs2/4vs2)
Small-Sided Games	Match-play with reduced number of players and two goals (No conditions imposed)
Conditioned Games	As small-sided games, but includes variations to rules and areas of play (e.g., Players can't cross half way, X number of passes needed before shooting, possessions, steps only)
Phase of Play	Unidirectional match-like play, toward one goals (e.g., One team always attacks)
Full-Sided Game	Actual match-play. Game played with the full complement of players present at a training session. Regulation rules with two goals.
<b>Inactivity</b>	Moments during the training session where the teams are not physically engaged participating in either training or playing form activities
Freeze in position	Coach stops the activity to talk to the players and the players remain in their current position during the activity (i.e., "stop and hold there . . .")
Coach-Player huddle	Coach stops the activity and gets the players to come together for a discussion in a certain area (i.e., "stop and bring it in.")
Player-huddle	Coach stops the activity and asks players to lead a discussion without coach's presence (i.e., "attackers have a chat amongst yourselves . . .")
Drink break	Periods of time where the players have been told by the coach to have rest and a drink (i.e., "stop there and go get a drink . . .")
Transition	Periods of time where the players are moving (or transitioning) between activities or inactivity periods such as the players moving back into position following a player huddle or drink break

game was piloted on three occasions with different academy teams, overseen by a coach, performance analyst, and sport pedagogue. This process validated halftime recovery, playing area size, rules, and camera positioning. Adjustments were made based on feedbacks, such as changing bibs for better visibility and prohibiting backward passes to goalkeepers, enhancing intensity and tactical challenges. Games were recorded using a camcorder, positioned at a fixed height of 4 m in the bottom left corner for optimal view and bib number readability. This positioning, refined through pilot testing, allowed comprehensive coverage of player movement and facilitated bib number identification. The finalized rules and procedures are detailed in Supplement 1.

**Game performance instrument.** The GPOI (Turner & Martinek, 1992) was tailored for this study to evaluate players' performance in the assessment games. Collaborating with three seasoned Gaelic football coaches, an experienced performance analyst, and two researchers proficient in performance assessment, criteria were established for assessing control, decision-making, and skill execution in passing, carrying, and shooting. Video recordings of pilot games were scrutinized to develop and refine definitions, with panel consensus achieved through remote communication due to scheduling constraints. The final adapted GPOI version categorized behaviors into control, decision-making, and execution, reflecting the sequence of actions in Gaelic football (see Supplement 2). Coding for control, decision-making, and skill execution occurred on a continuous basis facilitated by the rules of Gaelic football. Specifically, anytime a player received the opportunity to gather possession, they were assessed for control. Following the initial act of gaining possession, the rules of Gaelic football; which require a player to execute a skill (i.e., solo/hop, handpass, kickpass, or shot) within four steps;

ensured that each possession was evaluated for decision-making and skill execution, a process that was repeated continuously throughout the coding.

The RA, who held Level 1 Gaelic game coaching qualifications, performed coding of assessment game performance videos. Observer training for the coding of assessment games followed a 5-step process (McKenzie & Van Der Mars, 2015) and was overseen by the sports pedagogue and an experienced performance analyst. For training, the performance analyst and RA collaborated on coding pilot games using the GPOI, discussing coding definitions, the rationale behind coding decisions, and the criteria required for various decisions. This iterative training process continued until both the performance analyst and RA were confident in the coding procedure. Inter-observer reliability checks were performed by the RA and the experienced performance analyst coding a sample game for each squad from both the baseline and posttest assessment phases, more than the minimum value of 10% stipulated in the literature (Tabachnick et al., 2007), yielding inter-observer agreement rates of 98.1% for control, 88.8% for decision-making, and 98.1% for skill execution. Intra-observer reliability was also performed with the RA recoding one game for each squad from baseline and posttests, 3 weeks after initial coding. Intra-observer reliability scores were 98.1% for control, 90.5% for decision-making, and 96.3% for skill execution, all exceeding the recommended reliability threshold of 85% (McKenzie & Van Der Mars, 2015).

### **Players' perceptions**

Players' perceptions were gathered through post-session interviews and post-intervention focus group interviews. In post-session interviews, two players from each squad spoke with the sports pedagogue away from coaches to promote open discussion. Thirty interviews (U14  $n = 12$ ; U15  $n = 18$ ) were conducted with players, lasting up to 5 min each, recorded using

a mobile device. Additionally, end-of-season focus groups with six players from each squad aimed to gather perceptions on the intervention's impact, aligning with quantitative data. Interviews followed a semi-structured format, focusing on game-based pedagogy elements' effects on learning and experiences. Open-ended questions facilitated group discussions, allowing players to express themselves freely. Focus group durations were approximately 33 and 34 min for the U14 and U15 squads, respectively.

## Data analysis

### Session characteristics

Overall playing form/training form activity and overall inactivity was analyzed using visual inspection methods. Raw data were plotted according to the percentage time players spent in an activity and in accordance with Martin and Pear (2019), the researcher used visual inspection of the data and the following criteria to establish the occurrence of any intervention effects: (a) the number of overlapping data points between the baseline and post-intervention phases, where fewer overlaps suggest a stronger experimental effect; (b) the immediacy that an effect was observed following intervention; (c) the size of an effect after intervention; (d) when baseline measures are stable or in the direction opposite to that predicted for the intervention; (e) consistency across populations (i.e., U14 and U15), where increased consistency indicates a generalized pattern of the intervention. Additionally, effect sizes denoted by  $r$  were calculated based on the parameters set out by Parker and Vannest (2009); small effect ( $<0.87$ ), moderate effect ( $0.87 < x < 2.67$ ), large effect ( $>2.67$ ). The subcategories within playing/training form (e.g., drills) and inactivity (e.g., player huddle) were calculated and summarized using frequencies and percentages. Finally, data relating to sequencing of practice activities within coaching sessions were summarized using frequencies and percentages.

### Players' game performance scores

The dependent variables for game play (control, decision-making, and execution) were calculated as percentages of appropriate responses out of total opportunities to respond. These dependent variables were organized into "families": control, decision-making (carrying, passing, shooting, overall), and skill execution (carrying, passing, shooting, overall). Changes from pre- to post were then tested using a pairwise t-test (decision-making overall, skill execution shooting, skill execution overall) or Wilcoxon signed ranks test (control, decision-making passing, decision-making carrying, decision-making shooting, skill execution passing, skill execution carrying) based on normal distribution of data. The significance level for each family was set at  $p < .05$ . A Holm-Bonferroni adjustment was used to control Type I familywise error rate (Holm, 1979). The Holm-Bonferroni adjusted  $p$ -values were obtained by ordering  $p$ -values from lowest to highest. The smallest  $p$ -value was then multiplied by  $k$ , where  $k$  was the number of hypotheses to be tested (in this case, four). The resulting  $p$ -value was considered to be statistically significant if it was less than 0.05. The next smallest  $p$ -value was then multiplied by  $k - 1$  and again compared to 0.05. The  $p$ -values reported in the Results section reflect the adjusted  $p$  values as obtained through

this process. The statistical analyses were conducted using SPSS v. 25.0 for Windows (SPSS, Inc., Chicago, IL).

### Players' perceptions

Qualitative data were analyzed using a similar approach to GBA intervention research in physical education and youth sport settings (Morales-Belando & Arias-Estero, 2017). Firstly, all post-session interview and focus group data were transcribed verbatim and open coding was conducted line by line at a descriptive level (Patton, 2014) using NVIVO software (QSR International Pty, Ltd, 2012). This process of open coding involved the generation of codes/lower order themes in the dataset to organize data and facilitate its retrieval (Patton, 2014). Deductive analysis was then conducted, where the code/lower order themes generated from open coding were organized under the preexisting categories used in the quantitative data (i.e., practice activity, inactivity, sequence, decision-making, and skill execution). A second member of the research team inspected the coding and provided feedback in relation to the structure and organization of data.

## Results

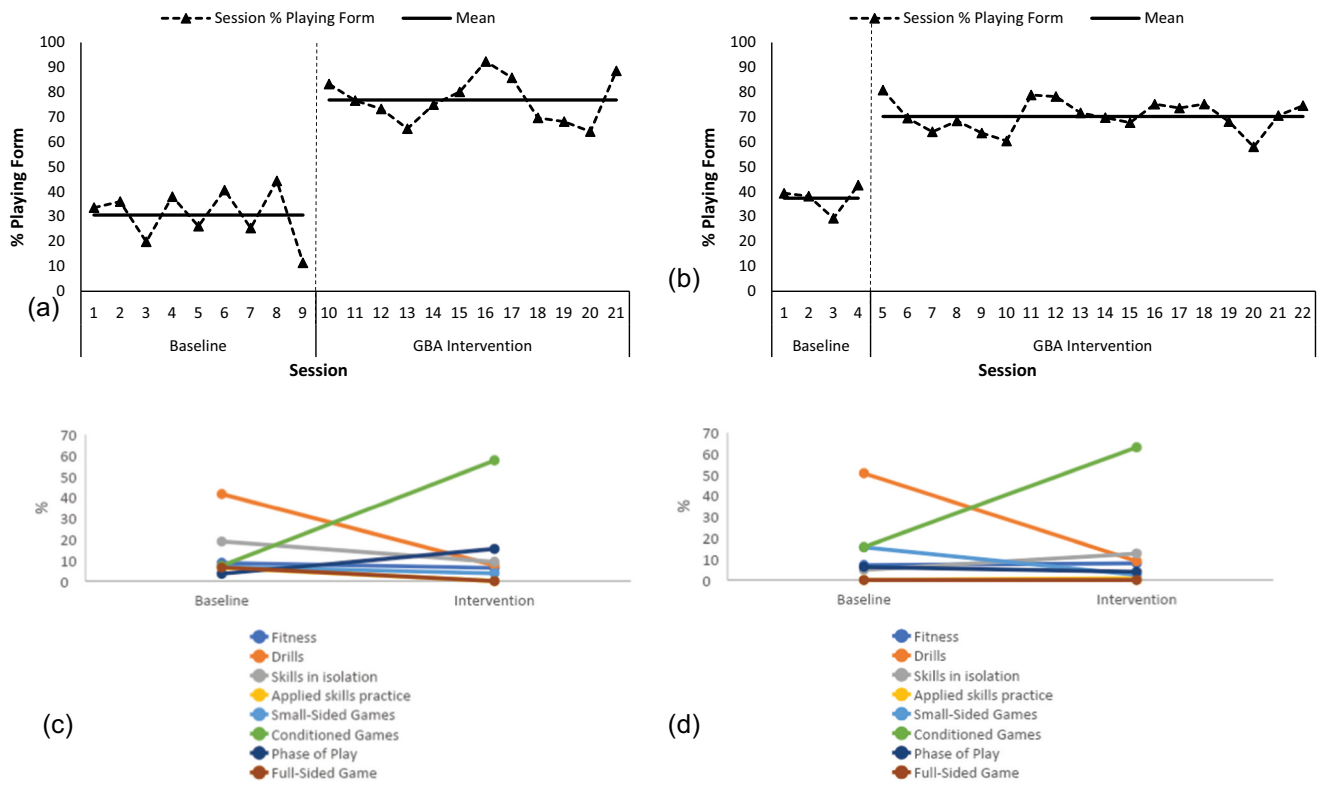
### Session characteristics

#### Practice activities

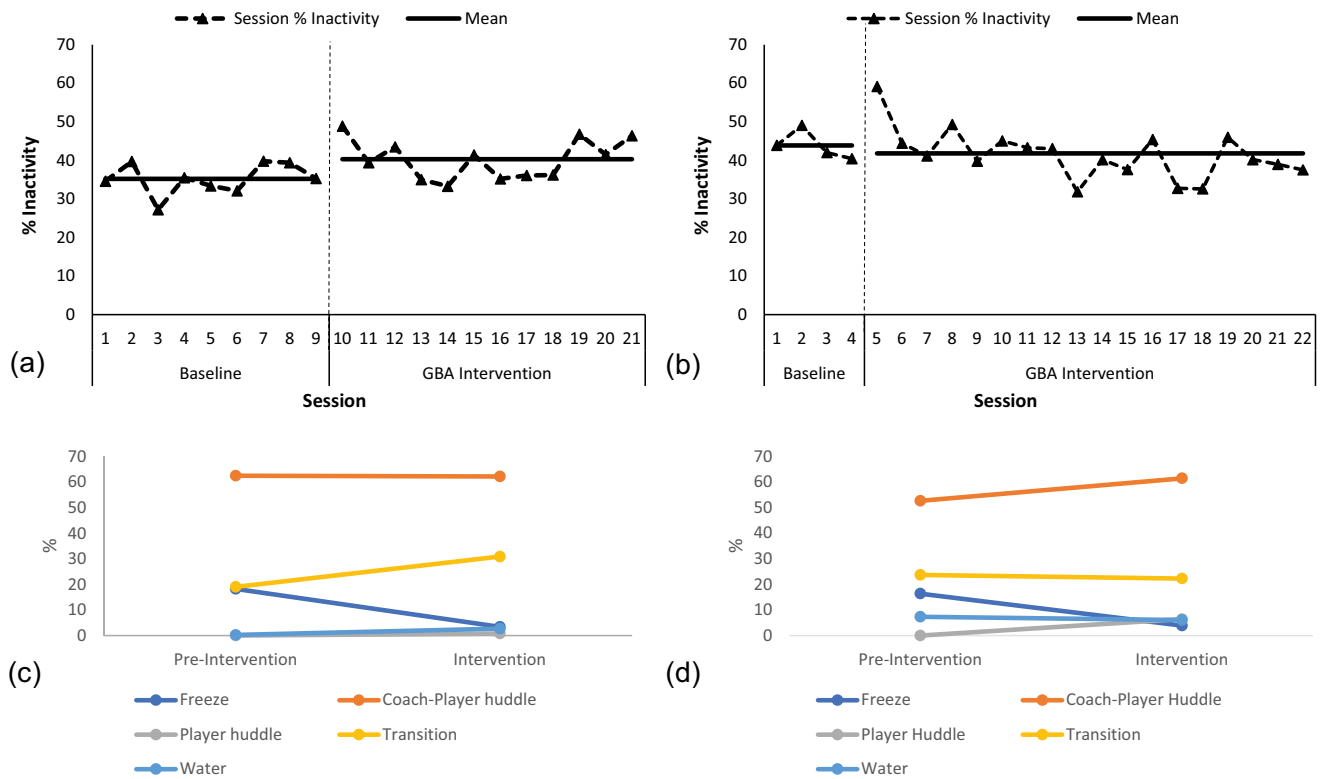
Practice sessions averaged 78.8 min for the U14 team and 76.3 min for the U15 team during their respective baseline periods. Session duration averages during the GBA intervention were 81.4 min for the U14 squad and 84.4 min for the U15 squad. During baseline practice sessions, both squads spent the majority of time (U14s, mean ( $M$ ) = 69.4%; U15s,  $M$  = 62.6%) in training form activities. On average, the percentage of session time in playing form activities during the baseline was 30.6% for the U14 squad and 37.4% for the U15 squad (see Figure 1). In contrast, during the intervention there was a noticeable increase in the time spent by squads in playing form activities. The U14s' time spent in playing form activities increased to 76.9% ( $r = 4.32$ ) of session time during the GBA intervention while the U15s' time spent in game-related activities increased to 70.5% ( $r = 5.81$ ) (see Figure 1). Applying visual analysis to each graph, the absence of any overlapping points, the immediacy of change, and the magnitude of change between baseline and intervention suggest that the intervention successfully altered practice activity. Figure 1 also presents a breakdown and proportion of the specific activity type players engaged in during baseline and intervention phases. There were two primary changes in activity type across phases. There was a decline in the use of drills for both U14s (Baseline:  $M = 41.6%$ ; Intervention:  $M = 7.6%$ ) and U15s (Baseline:  $M = 50.6%$ ; Intervention:  $M = 9%$ ). There was an increase in the use of conditioned games for both U14s (Baseline:  $M = 7.4%$ ; Intervention:  $M = 57.6%$ ) and U15 (Baseline:  $M = 15.6%$ ; Intervention:  $M = 63%$ ). There was little variation in other activity types across baseline and intervention phases.

#### Inactivity

The times at which players were not physically active within a practice activity are presented in Figure 2. Both the U14 squad (baseline,  $M = 35.2%$ ; intervention,  $M = 40.3%$ ;  $r =$



**Figure 1.** Percentage of time U14 (a) and U15 (b) players spent in training form and playing form activities across both phases (pre-intervention and intervention) of the season. Breakdown of the specific activity types U14 (c) and U15 (d) players engaged in and the percentage time spent within each activity type for both phases of the season.



**Figure 2.** Percentage of time that U14 (a) and U15 (b) players were not actively involved in a practice activity within the baseline and intervention phase of the season. Breakdown of the specific inactivity types U14 (c) and U15 (d) players were engaged in.

1.24) and U15 squad (baseline,  $M = 43.9\%$ ; intervention,  $M = 41.6\%$ ;  $r = -0.6$ ) showed little change in the time spent in periods of inactivity across baseline and intervention phases. Using visual analysis methods to compare data during baseline and intervention for both squads highlights an overall consistency across populations, with many overlapping data points, and a small effect suggesting little change in inactivity time due to the intervention. The breakdown of how players spent these periods of inactivity within practice activities is also reflected in [Figure 2](#). The time players spent in coach-player huddles represented the greatest form of inactivity type across both squads and both phases of the season. Overall, there was little variation in the type of inactivity players were exposed to between baseline and intervention phases. Both squads reduced the freeze periods they employed from baseline to intervention. Player huddle was the least used form of inactivity for both groups during baseline observations; however, there was a noticeable increase within this category for the U15 squad from baseline to intervention.

### Session sequencing

The placement of practice activities within the coaching session was recorded throughout the study and the coaches' sequencing at baseline and during the intervention is reflected in [Figure 3](#). Both sets of coaches emphasized skill practice in the early part (activity 1, activity 2) of their session in the baseline phase through their predominant utilization of drill practice activities. The latter part of the coaching sessions pre-intervention was predominantly playing form activities. The introduction of the GBA intervention yielded a noticeable change in coaches' sequencing of practice activities. In contrast to pre-intervention coaching sessions, coaches predominantly used game-related activities in the form of conditioned games as the initial practice activity. While there was a noticeable reduction in technical skill practice activity types (i.e., drills, isolated skills practice), the employment of these activity types now took place in the middle (activity 3) of coaching sessions.

### Players' game performance scores

Descriptive and inferential statistics for player performance scores are reported in [Table 3](#). Baseline scores reported are an average of the players' scores across the 4 weeks of baseline testing. Posttest scores are the average of players' scores across the 2 weeks of posttests. Statistical output for each comparison is contained in [Table 3](#). U14 players showed significant improvements in overall decision-making, as well as in each of the three individual decision-making scores (passing, shooting and carrying). U14 players also showed a significant improvement in overall skill execution; however, within the individual skill execution scores, only carrying showed a significant improvement relative to baseline. U14 players showed no change in their control scores. U15 players significantly improved in all decision-making variables. Furthermore, U15 players showed significant improvements in ball control, but did not show any improvements in any of the skill execution scores.

### Players' perceptions

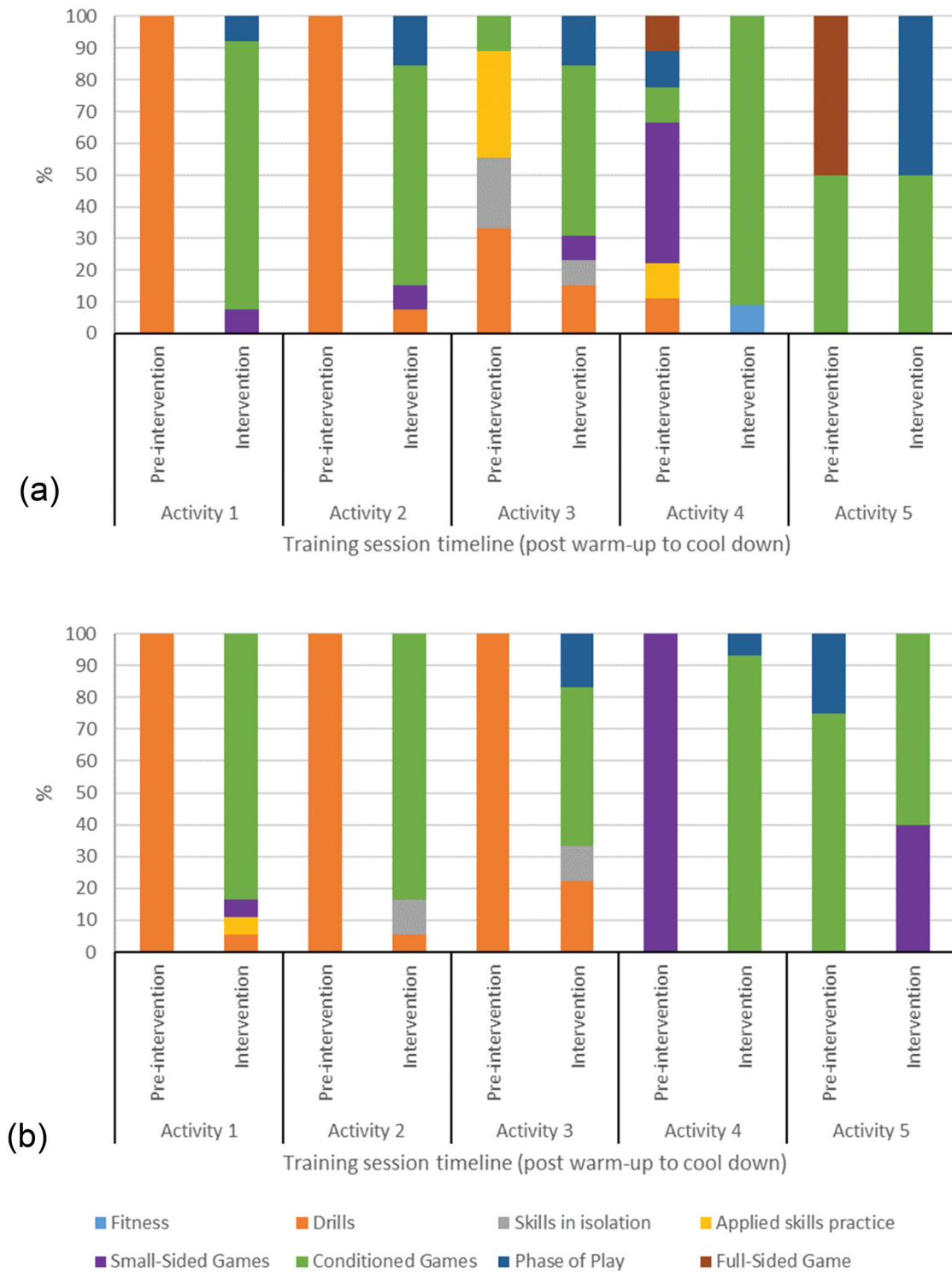
The player qualitative data were organized under the preexisting categories used in the quantitative data (i.e., practice activity, inactivity, sequence, decision-making, and skill execution) and revealed players were largely supportive in receiving GBA pedagogy. Players broadly linked their perceived improvements in performance as a consequence of the GBA intervention. More specifically, players suggested their improved performance was mainly due to (a) an increase in playing form with conditioned games, (b) questioning, and (c) the enactment of a targeted tactical theme curriculum. Players were also positive in relation to the new sequence of sessions and integration of skills practice within games. Players were less supportive of "player huddles" which they deemed to be unproductive. Supplement 3 highlights the structure used for the qualitative data and provides some examples of player responses.

### Discussion

The aim of this study was to evaluate the efficacy of a GBA intervention for the improvement of game performance outcomes (decision-making and skill execution) in academy Gaelic football players, and investigate the effects of the intervention on practice session characteristics (activity type, sequence, inactivity) and players' perceptions. The study findings revealed significant improvements in all decision-making variables for both squads. There were, however, only improvements in two of the four variables for the U14 squad in skill execution, while there was no significant change for the U15 group in any of the variables for skill. Regarding session characteristics, the GBA intervention resulted in an increase in player exposure to playing form activity and non-linear sequencing of practice activities, with little change noted in periods of inactivity across baseline and intervention phases. The study also revealed players responding positively to receiving GBA pedagogy, linking it with improvements in their performance. The results of the intervention are now discussed under the following headings, based on the framework of CLT: (a) active engagement, (b) social interaction, and (c) interpretative learning.

### Active engagement

The principle of "learning is active," central to both the GBA approach and CLT, was embedded throughout the intervention. By designing realistic, game-like activities grounded in tactical themes, the intervention actively engaged players in meaningful decision-making and skill execution, aligning them with the foundational principles of exaggeration and representation. Consistent with the "learning is active" framework within complex learning theory, the improvements in decision-making observed in this study suggest that players benefited from engaging directly with realistic, game-like activities. These findings align with previous research implementing GBA interventions in coaching settings (Harvey et al., 2010; Miller et al., 2016; Práxedes et al., 2016). Unlike previous studies, however, this research also employed qualitative methods to actively engage players in reflecting on their decision-making development, contextualizing these reflections with



**Figure 3.** U14 (a) and U15 (b) coaches' sequencing of practice activities during the pre-intervention and intervention phases of the season (e.g., during the pre-intervention phase, coaches from both teams used drills 100% of the time as activity 1 in their training sessions).

game performance scores. Through this qualitative analysis, players expressed a sense of development in their decision-making:

Their [fellow players'] decision-making is a lot better than it was at the start of the year, like they're not just going straight for goal anymore; they're looking for an option to see if anyone's in a better position. (U15 player, focus group interview)

The observed improvements from baseline to posttest may be attributed to players' increased exposure to playing-form activities (see Figure 1), which provided them with active decision-making opportunities. This aligns with CLT's emphasis on active learning, as players were directly involved in making strategic choices within game-like contexts. Research highlights the use of playing-form activities as an effective means

**Table 3.** Performance scores for U14 and U15 players.

	U14 Players							U15 Players						
	Pre		Post		TS	r	p	Pre		Post		TS	r	p
	CT	V	CT	V				CT	V	CT	V			
#Control (% success)	95.7	4.4	93.8	11.5	-0.66	0.14	.509	93.1	7.5	100.0	6.9	2.274	0.44	.023*
Decision-making (% appropriate)														
#Passing	84.2	12.7	96.4	8.3	-3.62	0.75	.004*	80.0	14.7	100.0	14.3	3.566	0.69	.004*
#Carrying	70.5	19.4	92.3	29.8	-2.469	0.53	.028*	76.1	28.6	89.9	25.0	2.329	0.46	.02*
#Shooting	66.7	45.0	100.0	41.7	-2.015	0.44	.044*	66.7	28.6	88.9	20.0	3.938	0.76	.002*
Overall	77.8	7.9	89.1	7.6	-5.129	0.74	.003*	74.2	10.2	87.7	8.6	-5.69	0.74	.003*
Skill execution (% successful)														
#Passing	84.0	8.9	83.3	15.0	-0.731	0.15	.465	81.3	18.0	84.2	33.3	1.867	0.36	.186
#Carrying	78.4	15.9	97.4	21.0	-3.042	0.65	.008*	90.2	25.0	94.4	17.1	1.686	0.33	.184
Shooting	54.6	21.0	59.9	28.6	-0.768	0.17	.902	48.6	17.6	53.1	23.0	-0.78	0.15	.442
Overall	74.9	7.8	80.5	10.1	-2.761	0.51	.033*	70.8	11.7	75.9	10.1	2.284	0.41	.124

Note. CT = Central Tendency (mean or median); V = variability (standard deviation or interquartile range); TS = Test Statistic (Student's t or Wilcoxon Z); r = Effect size; p = p-value (\* = .05); # indicates data that was not normally distributed and hence the median and interquartile range provide descriptive statistics and Wilcoxon's signed ranks test was used for inferential analysis.

to engage players in decision-making compared to technique-focused tasks (e.g., Deuker et al., 2024; Farrow et al., 2008; O'Connor et al., 2018). For example, Farrow et al. (2008) found that playing-form activities in Australian football offered players 535 decision-making opportunities, while training-form tasks provided zero. However, as shown in the baseline data in this study (see Figure 1), coaches in invasion games often devote significant time to activities that are less applicable to real-game situations, which can reduce players' opportunities to engage in active decision-making (Ford et al., 2010; Harvey et al., 2013; Kinnerk et al., 2019).

The benchmark for incorporating more game-related activity serves as an important guideline for coaches adapting to GBAs (Kinnerk et al., 2019). However, it is critical that coaches support such change by designing playing form activities in a manner that targets desired decision-making outcomes (Mitchell et al., 2013). This study is the first GBA intervention in invasion games to systematically document changes in specific activity types (e.g., conditioned games, phases of play) across baseline and intervention phases, offering deeper insight into the likely causes of the observed improvements (Lyle, 2018). The significant increase in time spent on conditioned games from baseline to intervention (see Figure 1) highlights how actively engaging players in game-relevant tasks can enhance decision-making. By applying GBA principles, such as exaggeration and representation within conditioned games, coaches, were able to create an environment where learning is not only active but also meaningful:

They put in a condition where you had to kick the ball across the halfway line, and from that kick, you had to have support play with a man off the shoulder to receive the pass. So it meant you were thinking about what you had to do off the ball a bit more. (U15 player, post-session interview)

Such conditions within games guided players toward specific tactical behaviors, reinforcing the active learning component of CLT by prompting players to interpret and adapt to the game context (Chow et al., 2016; Ramos et al., 2021). These conditions encouraged players to actively engage in off-the-ball movement by drawing on prior experience to understand the requirements and devise effective solutions (Light &

Clarke, 2021). This focus on off-the-ball movement likely facilitated players' understanding of support roles, thereby increasing options for the player in possession and enhancing the likelihood of appropriate decision-making. In contrast, such sustained emphasis on off-the-ball movement is often absent in traditional, technique-focused coaching approaches (Deuker et al., 2024). The high proportion of conditioned games during the intervention phase, combined with positive results in players' decision-making, suggests that well-designed conditioned games with appropriate task constraints and questioning actively engage players in learning, thereby enhancing their game performance in line with CLT's "learning is active" approach.

The results of this study underscore that the GBA season plan, composed of collaboratively developed tactical themes and principles, may have actively engaged players in the decision-making process, potentially driving improvements in their performance. Within the "learning is active" framework of CLT, this approach required players to actively process and apply tactical themes as the central focus of each session (Bunker & Thorpe, 1982; Mitchell et al., 2013). By grounding sessions into specific tactical principles, the GBA model created an active learning environment where players can meaningfully engage with tactical concepts, as noted by players contrasting this with previous, less focused sessions:

I rather these ones, focusing on a specific thing each session. Like you get to go into something like 'attacking' in-depth. It's better than before where you would be touching off of everything. (U15 player, post-session interview)

Normally, we just focus on skills practice and stuff, but today we focused on tactical stuff to do with keeping possession. The 3 main things: creating space, having a clear line of sight and talking. (U14 player, post-session interview)

This active engagement in tactical themes likely enhanced players' recall and application of tactical principles, suggesting that the GBA curriculum (see Table 1) may have equipped players with a broader tactical repertoire that directly supported their in-game performance. Furthermore, players' use of specific principles as externally focused cues (e.g., "To keep

recycling it when there are no options”; “clear line of vision. You need to be able to see him on a clear line before you pass the ball to him”) indicates an active process of using guiding cues to shape decision-making. Such cues reinforce the CLT notion that learning is not only active but also strategic, as players apply these principles dynamically to adapt to game contexts. To maximize the effectiveness of active learning in tactical instruction, coaches should continue to develop and prioritize these types of guiding cues, shown to enhance performance by fostering a deeper understanding of the tactical curriculum (Chow et al., 2016; Morales-Belando & Arias-Estero, 2017; Ribeiro et al., 2019). By using this active, cue-driven approach, players are better able to internalize and adapt tactical principles, embodying CLT’s view that active engagement is fundamental to learning and effective performance (Light & Clarke, 2021). Additionally, while not explicitly included in coaches’ session plans in this study, aligning specific learning objectives with the tactical and technical principles already emphasized could further enhance clarity in player development and maximize learning outcomes (Mitchell et al., 2013).

### Social interaction

Aligned with CLT’s emphasis on social learning, the intervention incorporated strategies to promote interaction and reflection among players and coaches. Through questioning, collaborative discussions, and structured “player huddles,” the intervention fostered a socially rich environment that encouraged players to engage in critical thinking and problem-solving. Players spent notable periods of time in both the baseline and intervention phases without being physically involved in practice activities. CLT’s emphasis on social interaction for learning means that how this time is structured can significantly impact players’ learning experiences (Harvey et al., 2013). While quantitative data showed little change in overall inactivity time from baseline to intervention, qualitative data highlighted shifts in the nature of these inactive periods—especially during “coach-player huddles,” which accounted for the highest proportion of inactivity (see Figure 2). In these huddles, a social learning approach emerged, with coaches involving players through questioning:

They would call us in and have like a quick chat about what was going well and what we could improve. But instead of telling us, they were now asking us. (U15 player, focus group interview)

The biggest difference is the amount of questions they (the coaches) keep asking us. (U14 player, post-session interview)

This change from instructive feedback to questioning aligns with the CLT tenet that learning occurs socially through engagement and reflection, as players are encouraged to actively participate in making sense of their performance. Although coaches may worry that increased questioning can hinder time management (Kinnerk et al., 2024), this study and others (Eather et al., 2019) found no significant increase in inactivity time. These findings may reassure coaches that incorporating questioning supports active engagement

without sacrificing efficiency. By involving players in reflective questioning, coaches fostered a socially interactive environment where players could think critically about their own performance:

If you do something wrong, the coaches ask you what you might do differently next time round, and it helps you make the right decision then next time. (U15 player, focus group interview)

Research supports that effective questioning prompts players to reflect and socially construct solutions, leading to improved problem-solving and decision-making (Mitchell et al., 2013). CLT suggests that this social process, involving interpretation and reflection with guidance, deepens players’ understanding (Light & Harvey, 2015). Interestingly, the “freeze” inactivity type accounted for a small proportion of the inactivity time. This perhaps reflects a missed opportunity for coaches to use these moments as “coachable moments” to model solutions, provide direct instruction, or employ questioning strategies (Kinnerk et al., 2024). Importantly, questioning need not be limited to “coach-player huddles” or water breaks but can also be effectively integrated into brief “freeze” moments to enhance reflection and learning (Light, 2013).

Another key social element of the GBA was the “player huddle” approach, where players were given time to debate strategies with reduced coach input. This method, quantified for the first time in this study, aims to promote peer discussion, player ownership, and problem-solving through social interaction (Gréhaigne et al., 2005; Light, 2013). Some players valued this opportunity for social learning, noting it fostered independent thinking and learning from peers, reflecting CLT’s concept that interaction with teammates enhances understanding (Light, 2008). However, many players either did not perceive the player huddles as impactful or were unaware of their presence, as shown in session data where the U15 squad rarely used these periods, with even fewer instances in the U14 squad (see Figure 2).

The limited effectiveness of “player huddles” may be attributed to the need for the coach to take on a facilitative role, guiding discussions without dominating them (Barquero-Ruiz & Kirk, 2024; Thomas et al., 2013). Some players noted that coaches could improve by participating more as active listeners to help focus discussions:

Like they could just come into the circle, don’t talk, and just listen to what we have to say, instead of us just talking about nothing. Like they come in but don’t talk, make sure we’re talking like. Don’t give their opinion. (U15 player, focus group interview)

For younger players or those new to GBA methods, coaches should gradually transition from a more directive approach to fostering a socially interactive learning environment (Thomas et al., 2013). Enhancing coaches’ training programs to include practical guidance on facilitating these player-led sessions could improve their effectiveness in implementing such strategies. Thus, while “player huddle” holds promise for promoting independent thinking and peer learning, their success depends on the coach’s ability to guide and support players’ discussions effectively.

## Interpretative learning

The GBA intervention emphasized that the principle of “learning is interpretative” from CLT. Practice sessions were structured with intentional sequencing, progressing from initial game forms to more advanced activities, to help players interpret and refine their skill execution in response to tactical demands. This approach encouraged players to adapt dynamically to game contexts, providing greater opportunities for learning and performance development. Aligned with the “learning is interpretative” element of CLT, skill development within GBAs may depend on players’ abilities to interpret and adjust their actions according to the game context. Recent reviews of GBAs in coaching and physical education settings have provided limited support for the enhanced development of technical skills through GBAs relative to alternative approaches (Kinnerk et al., 2018; Manninen et al., 2024; Miller, 2015). This finding contrasts with the original proposition that GBAs could develop players’ decision-making and technical skills simultaneously (Bunker & Thorpe, 1982). However, recent studies have supported the development of technical skills through GBAs, suggesting that players’ active interpretation of game scenarios could be key in facilitating skill improvement (Morales-Belando & Arias-Estero, 2017; Morales-Belando et al., 2018; Pizarro et al., 2017). The current research findings on the effectiveness of the GBA intervention for skill execution were mixed, with one squad (U14s) showing improvement in two technical skill variables (carrying, overall), while the U15 squad did not improve in any technical skill. These equivocal findings are not unique to this study. For example, in Pizarro et al. (2017), significant improvement was noted in passing execution but not in dribbling, which may reflect differences in how players interpreted and adapted their skills to specific game conditions. One reason for the U14 squad’s improvement in “carrying” could be attributed to the significant advances this group made in decision-making. Their enhanced decision-making when choosing to “carry” the ball likely allowed them to interpret the conditions effectively, reducing pressure during skill execution and increasing the likelihood of a successful outcome:

Because say you’re doing a game, then you’re going into a drill and working on your kicking and then after the game you can be like focused on kicking so you’re better. (U14 player, post-session interview)

The lack of improvement in skill variables for the U14 squad and the limited gains for the U15 squad align with prior research findings (Harvey et al., 2010; Miller et al., 2016; Nathan, 2015). Miller (2015) has suggested revising how technical skill is measured in GBA studies, emphasizing the need to assess skills within the context of the real game, which allows for players’ interpretative learning. Morales-Belando et al. (2017, 2018) observed significant skill improvements, possibly due to the consistent use of contextualized drills in every session, which encouraged players to interpret skill execution based on game demands—an approach that was less consistently applied in other studies (Harvey et al., 2010; Miller et al., 2016). Similarly, Morales-Belando et al. (2022) highlighted the importance of lesson structures that include modified games, technical drills, and reflective questioning to bridge the gap

between game tasks and full games, which may enhance the integration of decision-making and skill execution.

In the present study, the limited focus on applied skills practice may have impacted technical skill development, as players were perhaps not given enough opportunities to interpret and adapt skills within real-game contexts. Additionally, the high initial baseline outcomes in skill variables could have led to a ceiling effect, as seen in Miller et al. (2016), where high baseline scores limited observable improvement. Although current research has found limited support for the efficacy of GBAs in technical skill development, it is important to note, in line with systematic reviews (Kinnerk et al., 2018; Manninen et al., 2024) that players did not experience a decline in technical skills. This suggests that even if gains in skill development were limited, players retained their ability to interpret and apply skills within the context of the game.

This study represents the first attempt in coaching research to systematically track the sequencing of practice activities across a GBA intervention. Within the interpretative framework of CLT, the structured yet flexible design of practice activities encouraged players to interpret and connect various learning experiences throughout the session. Findings from the baseline period reflected the linear sequencing approach observed in the previous research (Kinnerk et al., 2019; O’Connor et al., 2018). However, during the intervention period, a notable shift occurred, with coaches moving from traditional technical skill practices to game-related activities—such as conditioned games—in the early stages of sessions (see Figure 3), aligning with GBA benchmarks (Turner & Martinek, 1999).

Players observed and appreciated this shift toward a more interpretative structure in practice activities, as illustrated in the following comments:

Like when we were focusing on forward play you are doing it through match situations all throughout the session as opposed to doing drills and then finishing with a match and going home. In these sessions, you are doing games early in the session so you get to learn from your mistakes and fix them by the time other games come later in the session. (U15 player, focus group interview)

I like it, you get to see what you need to improve on at the start, and you get to work on it throughout the training session. (U14 player, post-session interview)

The sequencing of initial game forms provided a space for players to interpret their performance in real-time and connect these early experiences to subsequent tasks within the session. This interpretative element enabled players to explore and experiment early on, offering a “primer” or advanced organizer for later tasks (“you get to work on it throughout the training”) (Mitchell et al., 2013). By connecting back to the initial game form, players were able to navigate the session with an evolving understanding, as they built upon prior interpretations and applied them to new contexts (Chang et al., 2020; Rink, 2020).

Players also noticed a coherent relationship between tasks, which contrasted with their previous, more linear experiences of session sequencing (“as opposed to doing drills and then finishing with a match and going home”). This interrelation

among tasks allowed players to interpret each new activity as part of a broader sequence, enabling a “spiralled” development of knowledge that built upon what they had learnt earlier (Rink, 2020). This iterative connection between tasks reflects the interpretative aspect of CLT, where learners actively engage in making sense of and integrating experiences over time (Gréhaigne et al., 2005; Kinnerk et al., 2023; Light & Harvey, 2015). Research supports that this type of reflective interpretation enhances tactical understanding, self-awareness, and critical thinking (Downham & Cushion, 2024; Harvey, 2009; Ramos et al., 2021), likely contributing to improvements in players’ decision-making as they connect insights from one task to the next.

### Limitations

This study has several limitations that warrant consideration. Coaching behaviors such as praise and questioning were not systematically observed, leaving a gap in understanding their specific role within the intervention. While changes in activity types were documented, the study did not provide detailed recording of task conditions, dimensions, or progressions, limiting insights into the specific developmental benefits of practice design. Additionally, the focus on skill execution, decision-making, and control as primary measures of game performance, while critical, does not fully capture the complexity of tactical learning and performance within GBA contexts. Finally, the long-term effects of the intervention remain unclear due to the absence of retention tests, leaving questions about the sustainability of observed improvements over time.

### Future research

Future research should explore several key areas to extend the insights gained from this study. Systematic observation of coaching behaviors using tools such as the Coach Analysis Intervention System (Cushion et al., 2012) or narrative analyses (Cope et al., 2016) could provide a deeper understanding of their impact on player learning and development. Additionally, task analysis documentation of key elements including conditions, dimensions, and progressions (Rink, 2020) may facilitate a more comprehensive understanding of practice design and help identify factors contributing to skill and tactical development. Further research should also incorporate more comprehensive tactical assessments that consider multi-level analyses, player roles, and game phases to offer a holistic perspective on the impact of GBAs on tactical learning (Barquero-Ruiz et al., 2020, 2024). Finally, evaluating the long-term effects of GBA interventions through retention tests would be valuable in assessing whether improvements in player and coach performance are sustained over time.

### Conclusion

The purpose of this study was to investigate the effects of a GBA intervention on practice session characteristics, player performance outcomes, and player perceptions. The current research supports the use of GBAs to positively

impact practice session characteristics and player outcomes. The GBA intervention resulted in an increase in playing form and non-linear sequencing of practice activities. In addition, despite the emphasis on GBAs of applying structured periods of questioning, there was little change in inactivity periods across baseline and intervention phases. With regard to performance outcomes, both squads significantly improved in all decision-making variables. This study provides support for the efficacy of conditioned games, player inquiry and a targeted tactical-themed curriculum in positively impacting player decision-making. There was limited support for the development of technical skills through GBAs with only one squad improving in two (of four) skill execution variables. Players were largely supportive in receiving the new pedagogical approach highlighting and validating coaches’ use of games, the specifically designed GBA tactical curriculum and coach-player huddles as the greatest areas of change resulting in perceived positive effects. Systematic tracking of practice activity sequencing supported by player qualitative data revealed players’ awareness of purposeful organization, with the explicit connection between tasks fostering knowledge development and active reflection, potentially enhancing decision-making skills. However, players were less supportive regarding the player-centered strategy of “player huddles.” Thorough data collection methodology makes a distinct contribution to bridging the gaps outlined in sports coaching research (Lyle, 2018) by offering genuine insights into the efficacy of interventions. The study suggests that GBA interventions may effectively enhance player performance and session quality, offering valuable insights for coaches aiming to optimize training methodologies in Gaelic football and other invasion game sports, with GBA pedagogy supported by CLT potentially providing a useful roadmap for coaches seeking to enact tangible changes in their coaching practice.

### Disclosure statement

No potential conflict of interest was reported by the author(s).

### Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

### ORCID

Paul Kinnerk  <http://orcid.org/0000-0002-9636-6108>  
 Philip E. Kearney  <http://orcid.org/0000-0003-3425-663X>  
 Stephen Harvey  <http://orcid.org/0000-0002-1854-4108>  
 Mark Lyons  <http://orcid.org/0000-0003-1269-4890>

### References

- Abad Robles, M. T., Collado-Mateo, D., Fernández-Espínola, C., Castillo Viera, E., & Gimenez Fuentes-Guerra, F. J. (2020). Effects of teaching games on decision making and skill execution: A systematic review and meta-analysis. *International Journal of Environmental Research and Public Health*, 17(2), 505. <https://doi.org/10.3390/ijerph17020505>

- 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. <https://doi.org/10.1177/1356336X19889649>
- Barquero-Ruiz, C., & Kirk, D. (2024). If ‘the medium is the message’, what do students learn to do in NLP and GBAs within physical education? *Curriculum Studies in Health and Physical Education*, 15(1), 40–57. <https://doi.org/10.1080/25742981.2023.2216188>
- Barquero-Ruiz, C., Kirk, D., Meroño, L., & Arias-Estero, J. L. (2024). Psychometric validation of the tactical assessment instrument in football for use in physical education and with youth sport teams. *Perceptual and Motor Skills*, 131(2), 589–611. <https://doi.org/10.1177/00315125231225579>
- Bunker, D., & Thorpe, R. (1982). A model for the teaching of games in secondary schools. *Bulletin of Physical Education*, 18(1), 5–8.
- Butler, J. (2014). TGfU—would you know it if you saw it? Benchmarks from the tacit knowledge of the founders. *European Physical Education Review*, 20(4), 465–488.
- Chang, S. H., Ward, P., & Goodway, J. D. (2020). The effect of a content knowledge teacher professional workshop on enacted pedagogical content knowledge and student learning in a throwing unit. *Physical Education and Sport Pedagogy*, 25(5), 493–508. <https://doi.org/10.1080/17408989.2020.1743252>
- Chow, J. Y., Davids, K., Button, C., & Renshaw, I. (2016). *Nonlinear pedagogy in skill acquisition: An introduction*. Routledge.
- Cope, E., Partington, M., Cushion, C. J., & Harvey, S. (2016). An investigation of professional top-level youth football coaches’ questioning practice. *Qualitative Research in Sport, Exercise and Health*, 8(4), 380–393. <https://doi.org/10.1080/2159676X.2016.1157829>
- Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE Publications.
- Cushion, C. (2013). Applying game centered approaches in coaching: A critical analysis of the ‘dilemmas of practice’ impacting change. *Sports Coaching Review*, 2(1), 61–76. <https://doi.org/10.1080/21640629.2013.861312>
- Cushion, C., Harvey, S., Muir, B., & Nelson, L. (2012). Developing the Coach Analysis and Intervention System (CAIS): Establishing validity and reliability of a computerised systematic observation instrument. *Journal of Sports Sciences*, 30(2), 201–216. <https://doi.org/10.1080/02640414.2011.635310>
- Deuker, A., Braunstein, B., Chow, J. Y., Fichtl, M., Kim, H., Körner, S., & Rein, R. (2024). “Train as you play”: Improving effectiveness of training in youth soccer players. *International Journal of Sports Science & Coaching*, 19(2), 677–686. <https://doi.org/10.1177/17479541231172702>
- Downham, L., & Cushion, C. (2024). Reflection and reflective practice in high-performance sport coaching: A heuristic device. *Physical Education and Sport Pedagogy*, 29(6), 601–620. <https://doi.org/10.1080/17408989.2022.2136369>
- Eather, N., Jones, B., Miller, A., & Morgan, P. J. (2019). Evaluating the impact of a coach development intervention for improving coaching practices in junior football (soccer): The “MASTER” pilot study. *Journal of Sports Sciences*, 1–13. <https://doi.org/10.1080/02640414.2019.1621002>
- Evans, J. R., & Light, R. L. (2007). Coach development through collaborative action research—A rugby coach’s implementation of game sense pedagogy. *Asian Journal of Exercise & Sports Science*, 4(1), 1–8.
- Farrow, D., Pyne, D., & Gabbett, T. (2008). Skill and physiological demands of open and closed training drills in Australian football. *International Journal of Sports Science & Coaching*, 3(4), 489–499. <https://doi.org/10.1260/174795408787186512>
- Ford, P. R., Yates, I., & Williams, A. M. (2010). An analysis of practice activities and instructional behaviours used by youth soccer coaches during practice: Exploring the link between science and application. *Journal of Sports Sciences*, 28(5), 483–495. <https://doi.org/10.1080/02640410903582750>
- Gréhaigne, J. F., Wallian, N., & Godbout, P. (2005). Tactical-decision learning model and students’ practices. *Physical Education and Sport Pedagogy*, 10(3), 255–269. <https://doi.org/10.1080/17408980500340869> (Teaching Games for Understanding).
- Harvey, S. (2009). A study of interscholastic soccer players perceptions of learning with game sense. *Asian Journal of Exercise & Sports Science*, 6(1), 1–10.
- Harvey, S., Cushion, C., Cope, E., & Muir, B. (2013). A season long investigation into coaching behaviours as a function of practice state: The case of three collegiate coaches. *Sports Coaching Review*, 2(1), 13–32. <https://doi.org/10.1080/21640629.2013.837238>
- Harvey, S., Cushion, C., Wegis, H. M., & Massa-Gonzalez, A. N. (2010). Teaching games for understanding in American high-school soccer: A quantitative data analysis using the game performance assessment instrument. *Physical Education and Sport Pedagogy*, 15(1), 29–54. <https://doi.org/10.1080/17408980902729354>
- Holm, S. (1979). A simple sequentially rejective multiple test procedure. *Scandinavian Journal of Statistics*, 6(2), 65–70. <http://www.jstor.org/stable/4615733>
- Kazdin, A. E. (2021). *Single-case research designs: Methods for clinical and applied settings* (3rd ed.). Oxford University Press.
- Kinnerk, P., Harvey, S., Kearney, P., MacDonncha, C., & Lyons, M. (2019). An investigation of the self-reported practice activities and session sequencing of inter-county Gaelic football coaches. *International Sport Coaching Journal*, 6(2), 211–219. <https://doi.org/10.1123/iscj.2018-0090>
- Kinnerk, P., Harvey, S., MacDonncha, C., & Lyons, M. (2018). A review of the game-based approaches to coaching literature in competitive team sport settings. *Quest*, 70(4), 401–418. <https://doi.org/10.1080/00336297.2018.1439390>
- Kinnerk, P., Kearney, P. E., Harvey, S., & Lyons, M. (2023). An investigation of high-performance team sport coaches’ planning practices. *Sports Coaching Review*, 12(3), 253–280. <https://doi.org/10.1080/21640629.2021.1990653>
- Kinnerk, P., Kearney, P. E., Harvey, S., & Lyons, M. (2024). High performance team sport coaches’ perspectives of their use of in-session core coaching practices to stimulate player learning. *Sport, Education and Society*, 29(8), 983–996. <https://doi.org/10.1080/13573322.2023.2235588>
- Koekoek, J., Van Der Kamp, J., Walinga, W., & Van Hilvoorde, I. (2014). Dutch elite youth soccer players’ perceptions of a TGfU-modified game practice. *Agora for PE and Sport*, 16(3), 232–254.
- Light, R. L. (2008). Complex learning theory—Its epistemology and its assumptions about learning: Implications for physical education. *Journal of Teaching in Physical Education*, 27(1), 21–37. <https://doi.org/10.1123/jtpe.27.1.21>
- Light, R. L. (2013). *Game sense: Pedagogy for performance, participation and enjoyment*. Routledge.
- Light, R. L., & Clarke, J. (2021). Understanding the complexity of learning through movement. *Physical Education and Sport Pedagogy*, 26(3), 268–278. <https://doi.org/10.1080/17408989.2021.1886266>
- Light, R. L., & Harvey, S. (2015). Positive pedagogy for sport coaching. *Sport, Education and Society*, 1–17. <https://doi.org/10.1080/13573322.2015.1015977>
- Light, R. L., Harvey, S., & Mouchet, A. (2014). Improving ‘at-action’ decision-making in team sports through a holistic coaching approach. *Sport, Education and Society*, 19(3), 258–275. <https://doi.org/10.1080/13573322.2012.665803>
- Lyle, J. (2018). Reflecting on the development of a conceptual framework for sport coaching. *International Sport Coaching Journal*, 5(1), 90–98. <https://doi.org/10.1123/iscj.2017-0085>
- Manninen, M., Magrum, E., Campbell, S., & Belton, S. (2024). The effect of game-based approaches on decision-making, knowledge, and motor skill: A systematic review and a multilevel meta-analysis. *European Physical Education Review*, 31(1), 18–32. <https://doi.org/10.1177/1356336X241245305>
- Martin, G. L., & Pear, J. (2019). *Behavior modification: What it is and how to do it*. Routledge.
- McKenzie, T. L., & Van Der Mars, H. (2015). Top 10 research questions related to assessing physical activity and its contexts using systematic observation. *Research Quarterly for Exercise and Sport*, 86(1), 13–29. <https://doi.org/10.1080/02701367.2015.991264>
- Metzler, M. W. (2017). *Instructional models in physical education* (3rd ed.). Routledge.

- Miller, A. (2015). Games centered approaches in teaching children & adolescents: Systematic review of associated student outcomes. *Journal of Teaching in Physical Education*, 34(1), 36–58. <https://doi.org/10.1123/jtpe.2013-0155>
- Miller, A., Harvey, S., Morley, D., Nemes, R., Janes, M., & Eather, N. (2016). Exposing athletes to playing form activity: Outcomes of a randomised control trial among community netball teams using a game-centred approach. *Journal of Sports Sciences*, 35(18), 1–12. <https://doi.org/10.1080/02640414.2016.1240371>
- Mitchell, S., Oslin, J. L., & Griffin, L. L. (2013). *Teaching sport concepts and skills: A tactical games approach for ages 7 to 18*. Human Kinetics.
- Morales-Belando, M. T., & Arias-Estero, J. L. (2017). Effect of teaching races for understanding in youth sailing on performance, knowledge, and adherence. *Research Quarterly for Exercise and Sport*, 88(4), 513–523. <https://doi.org/10.1080/02701367.2017.1376032>
- Morales-Belando, M. T., Calderón, A., & Arias-Estero, J. L. (2018). Improvement in game performance and adherence after an aligned TGfU floorball unit in physical education. *Physical Education and Sport Pedagogy*, 23(6), 1–15. <https://doi.org/10.1080/17408989.2018.1530747>
- Morales-Belando, M. T., Kirk, D., & Arias-Estero, J. L. (2022). A systematic review of teaching games for understanding intervention studies from a practice-referenced perspective. *Research Quarterly for Exercise and Sport*, 93(4), 670–681. <https://doi.org/10.1080/02701367.2021.1897066>
- Nathan, S. (2015). Coaching school hockey in Malaysia: A exploratory analysis and effect of improvised TGfU pedagogical model on small sided game play. *Journal of Physical Education & Sport*, 15(4), 712–723.
- O'Connor, D., Larkin, P., & Williams, A. M. (2018). Observations of youth football training: How do coaches structure training sessions for player development? *Journal of Sports Sciences*, 36(1), 39–47. <https://doi.org/10.1080/02640414.2016.1277034>
- Parker, R. I., & Vannest, K. (2009). An improved effect size for single-case research: Nonoverlap of all pairs. *Behavior Therapy*, 40(4), 357–367. <https://doi.org/10.1016/j.beth.2008.10.006>
- Patton, M. Q. (2014). *Qualitative research and evaluation methods: Integrating theory and practice*. Sage.
- Pill, S. (2016). Implementing game sense coaching approach in Australian football through action research. *Ágora Para La Educación Física y El Deporte*, 18(1), 1–19.
- Pizarro, A. P., Domínguez, A. M., Serrano, J. S., García-González, L., & Del Villar Álvarez, F. (2017). The effects of a comprehensive teaching program on dribbling and passing decision-making and execution skills of young footballers. *Kinesiology*, 49(1), 74–83. <https://doi.org/10.26582/k.49.1.6>
- Práxedes, A., Moreno, A., Sevil, J., García-González, L., & Del Villar, F. (2016). A preliminary study of the effects of a comprehensive teaching program, based on questioning, to improve tactical actions in young footballers [article]. *Perceptual & Motor Skills*, 122(3), 742–756. <https://doi.org/10.1177/0031512516649716>
- QSR International Pty Ltd. (2012). *NVivo qualitative data analysis software* (Version 10) [Computer software].
- Ramos, A., Coutinho, P., Davids, K., & Mesquita, I. (2021). Developing players' tactical knowledge using combined constraints-led and step-game approaches—A longitudinal action-research study. *Research Quarterly for Exercise and Sport*, 92(4), 584–598. <https://doi.org/10.1080/02701367.2020.1755007>
- Ribeiro, J., Davids, K., Araújo, D., Guilherme, J., Silva, P., & Garganta, J. (2019). Exploiting bi-directional self-organizing tendencies in team sports: The role of the game model and tactical principles of play. *Frontiers in Psychology*, 10, 2213. <https://doi.org/10.3389/fpsyg.2019.02213>
- Richardson, S., McRobert, A., Vinson, D., Cronin, C., Lee, C., & Roberts, S. (2024). Systematic review of sport coaches' and teachers' perceptions and application of game-based and constraints-led pedagogy: A qualitative meta-study. *Quest*, 76(1), 113–134. <https://doi.org/10.1080/00336297.2023.2257343>
- Rink, J. E. (2020). *Teaching physical education for learning* (8th ed.). McGraw-Hill Education.
- Sport Ireland. (2015). *Irish sports monitor 2015 annual report*. <https://www.sportireland.ie/Research/Irish-Sports-Monitor-Annual-Report-2015/Irish-Sports-Monitor-Annual-Report-2015.pdf>
- Stolz, S., & Pill, S. (2014). Teaching games and sport for understanding: Exploring and reconsidering its relevance in physical education [article]. *European Physical Education Review*, 20(1), 36–71. <https://doi.org/10.1177/1356336X13496001>
- Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). *Using multivariate statistics* (Vol. 5). Pearson.
- Thomas, G., Morgan, K., & Mesquita, I. (2013). Examining the implementation of a teaching games for understanding approach in junior rugby using a reflective practice design. *Sports Coaching Review*, 2(1), 49–60. <https://doi.org/10.1080/21640629.2013.855000>
- Turner, A., & Martinek, T. J. (1992). A comparative analysis of two models for teaching games (technique approach and game-centered (tactical focus) approach). *International Journal of Physical Education*, 29(4), 15–31.
- Turner, A. P., & Martinek, T. J. (1999). An investigation into teaching games for understanding: Effects on skill, knowledge, and game play. *Research Quarterly for Exercise and Sport*, 70(3), 286–296. <https://doi.org/10.1080/02701367.1999.10608047>
- Van de Pol, J., Volman, M., & Beishuizen, J. (2010). Scaffolding in teacher–student interaction: A decade of research. *Educational Psychology Review*, 22(3), 271–296. <https://doi.org/10.1007/s10648-010-9127-6>