SPORTS SCIENCE FRAMEWORK FOR GAELIC GAMES: SKILL ACQUISITION

GAA WHERE WE ALL BELONG

LGFA PEIL na mBAN

THE CAMOGIE ASSOCIATION

Enhancing Skill Development in Gaelic Games through the application of Skill Acquisition

CONTENTS

OVERVIEW

This document introduces the science of Skill Acquisition. It provides guidance for clubs, coaches, players, coach developers and applied sport scientists who wish to enhance skill development by drawing upon this branch of the sport sciences in an integrated manner consistent with the values of Gaelic games.

The Gaelic Games Player Pathway provides a structure for participation, development and performance to ensure positive experiences for all players through their clubs, schools, colleges and counties. Healthy and holistic player development is led by coaches, parents and guardians and supported by approaches and practitioners from sports science. Sports Science involves using science to optimise participation, performance and wellbeing in Gaelic Games.

This document will answer the following questions:

1. What is Skill Acquisition and how can it add value to your coaching?
2. How can you apply Skill Acquisition principles to enhance your practice?
3. How can a Skill Acquisition Specialist or Coach Developer with a focus on Skill Acquisition help you to enhance your practice?
4. How can you identify a Skill Acquisition Specialist to support your club, your coaches, and your players?
5. How can applied scientists from other domains apply Skill Acquisition techniques?
6. Where can you learn more about Skill Acquisition?

WHY DO WE NEED AN INTRODUCTION TO SKILL ACQUISITION?

Like all of the sport sciences, Skill Acquisition is a constantly evolving discipline but is underpinned by some core principles. Aspects of the science of Skill Acquisition are mentioned in many coach education courses. However, such courses tend to provide only a brief introduction to the discipline. This document aims to provide all stakeholders in Gaelic Games with a clear understanding of both the application and implications for using Skill Acquisition at all levels of the Gaelic Games Player Pathway.

HOW TO USE THIS INTRODUCTION TO SKILL ACQUISITION?

There are many ways to engage with this document. Some will benefit from starting at the beginning of this guide and working their way through the full document; for others, specific sections will be relevant at different times depending on their role and the stage of the player pathway they are involved with. This guide will provide a high-level overview for many areas relating to Skill Acquisition and will direct readers to other opportunities to learn more about Skill Acquisition.

1. WHAT IS SKILL ACQUISITION?

"...you have to be skilful ... camogie is skilful"
(Ann Downey - Intercounty Camogie Player and Coach, Kilkenny)

Before we can understand the branch of sport science called Skill Acquisition, we need to define skill.

1.1 WHAT IS SKILL?

Games present problems for players to solve; for example, a defender faces the problem of how to delay or tackle an opponent in defence, while an attacker faces the problem of how to make more space for themselves or others to create a score. Skill is the ability to solve these problems that the game presents.

Defined in this way, skill is the *combination* of a player's ability to read the play and adapt their movement in relation to the context. Context refers to whether a player is standing still or moving, the distance to teammates and opponents and the speed and line on which they are moving, weather conditions, fatigue and many more factors; in short, context is any factor that a player must consider while playing. The complexity of Gaelic games means that every situation a player faces will require a unique solution; no two solos or strikes of a ball will ever be exactly the same. As such, adaptability is central to skill.

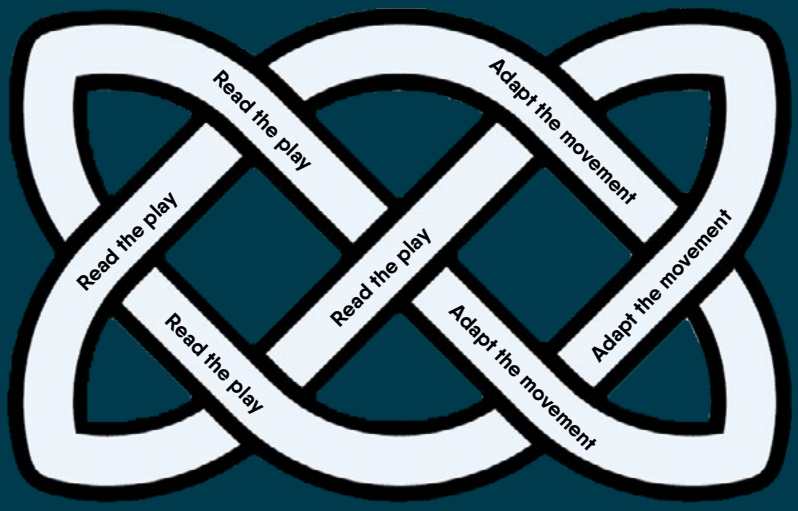


Figure 1. **The Celtic Sailor's knot represents how skill consists of cyclical combinations of reading the play and adapting movement to the context to continuously solve the problems the game presents.**

The speed of Gaelic games means that reading the play and adapting movement are not distinct processes, but instead occur in an interconnected manner[1], represented here by the Celtic Sailor's knot. For example, a player perceiving the possibility of carrying the ball upfield begins to move forward which reveals new possibilities (e.g., do I continue to run or pass?), which in turn prompts new movements which need to be adapted to the demands of the moment and so on. The Celtic Sailor's knot also illustrates how skill should not be perceived as a single discrete event, but rather as a continuous cycle of interactions[2].

[A] The quotations within this document come from interviews, podcasts and books from a range of coaches and players, at both inter-county and club level, to highlight that skill acquisition has the potential to benefit all levels within Gaelic Games.

The above examples focus on open play where the need to adapt one's movement is most obvious. However, each dead ball situation (e.g., a 45; a sideline cut) also places unique demands on the player; the distance, angle, ground surface, weather conditions, player fatigue and other contextual factors are always subtly different from attempt to attempt. The players who deal most successfully with dead ball situations are those who are best able to adapt to the demands of the moment.

KEY MESSAGE:

UNDERSTANDING SKILL AS INTERCONNECTED CYCLES OF READING THE PLAY AND ADAPTING MOVEMENT HAS IMPORTANT IMPLICATIONS FOR THE DESIGN OF TRAINING AND BROADER PLAYER DEVELOPMENT

1.2 WHY IS SKILL IMPORTANT?

"The more skills you master, the more options you possess in the game"
(Henry Shefflin –
Intercounty Player and Coach, Kilkenny)

"...practice as much as you can, have your hurley in hand as often as possible and work on improving all your skills in any way you can; there's always room for improvement"
(Aoife McGrath – Intercounty Player, Tipperary)

Developing skill is an important component for staying involved in Gaelic Games during childhood, adolescence, and adulthood. Players of all ages and levels consistently describe perceiving themselves as "competent", "improving skills" and "playing well" as important elements of their enjoyment of sport[3]. Thus, being able to improve all players' skill levels helps sustain participation.

Skill acquisition is not just for developing players; even players at the highest level of the game have the capacity to continue to develop their skillset with the right approach to practice. Indeed, a dedication to continuous development is what brought them to and sustains their success. Thus, effectively applying the science of Skill Acquisition to develop skill can enhance the experience of all players at every level of Gaelic games.

1.3 WHAT IS SKILL ACQUISITION?

To be effective, coaches need to consider Who they are coaching, What they are coaching, and How they are coaching[42]. Skill Acquisition is the science of practice, providing guidance to coaches on How to coach. It is a branch of the sport sciences that supports players and coaches to make the most out of each hour of practice[4-6]. Skill Acquisition guides coaches on how to provide instruction and feedback, how to select and sequence practice activities within a session and how to periodise skill development across a season[39,40]. Principles from the Skill Acquisition research also guide the long-term development of expertise and support the retention of children and adolescents in sport.

THE KEY QUESTION THAT SKILL ACQUISITION HELPS YOU TO ANSWER IS:

WHAT IS THE BEST WAY TO PRACTICE?

Skill Acquisition guides coaches in their development of practice environments that are (i) appropriate to the age and stage of every player and (ii) appropriately reflect the demands and characteristics of the sport throughout every session so that what you practice transfers into matches.

Skill Acquisition can provide guidance to coaches and players on the following areas:

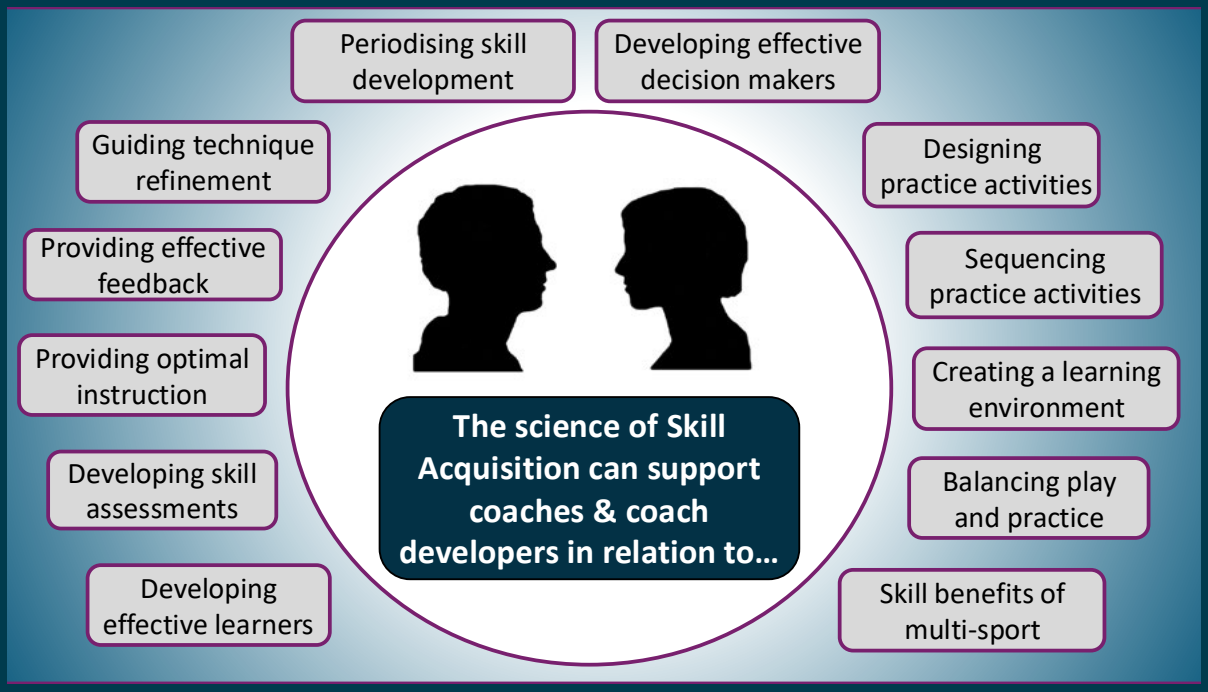


Figure 2. **Some areas where the science of Skill Acquisition can guide coaches, players and clubs to deliver more effective practice**

[B] While Skill Acquisition is the most common term for this sport science discipline within the UK, Ireland and Australia, the alternative label Motor Learning is also commonly used, particularly in resources from the United States..

1.4 WHAT ARE THE BENEFITS OF DEVELOPING YOUR KNOWLEDGE OF SKILL ACQUISITION?

My introduction to Skill Acquisition has underpinned my whole approach to coaching in the last number of years. It has opened a much wider view on what coaching and skills development could be: what is the role of the coach, the importance of the coach building their skill set, how the learner actually learns, that development is not a straight line. While daunting in its scope, part of the challenge was to incorporate into an environment driven by tradition and old methods and to get some traction even if only in small ways. There is a huge opportunity to tap into world-class Skill Acquisition resources locally and to embed it as the pillar of a long term development plan. I look forward to being able to call on resources to demonstrate the benefits and to build a modern Skill Acquisition approach into the clubs coaching development strategy in the short term.
(Shane Denn - Club Coach, Cork)

A coach of young players at the Foundation or Talent phases of the **Gaelic Games Player Pathway** may have limited practice time each week. At the other end of the performance spectrum, players at the High Performance and/or Elite phases have many demands on their time. Consequently, for players of all levels, it is important that time spent in individual and group practice is used most effectively. An understanding of Skill Acquisition enables coaches, players, and clubs to use their practice time efficiently and effectively. This understanding could impact decisions concerning what foundational skills young children should focus on, how to assist adolescents who are struggling with a particular skill, or how high performers can enhance their reading of the game. Examples of how Skill Acquisition can inform all players on the Gaelic Games Player Pathway are detailed in the Pathway Cards which accompany the **Gaelic Games Player Pathway & Sports Science 2030 Vision**. Fundamentally, by enhancing how practice time is used, Skill Acquisition has benefits for everyone.

HOW DOES SKILL ACQUISITION BENEFIT THE COACH?

- DEVELOP SESSIONS THAT REFLECT THE DEMANDS OF THE GAME AT THE PLAYERS' LEVEL OF DEVELOPMENT.
- PROVIDE MORE EFFECTIVE INSTRUCTION AND FEEDBACK, BOTH ON THE PITCH AND IN VIDEO-REVIEW SESSION.
- DEVELOP APPROPRIATE TESTS TO TRACK PLAYERS' SKILL DEVELOPMENT.

HOW DOES SKILL ACQUISITION BENEFIT THE PLAYER?

- UNDERSTAND HOW TO GET MORE OUT OF EVERY HOUR OF PRACTICE.
- BECOME A MORE EFFICIENT AND ADAPTABLE PERFORMER.
- BE CAPABLE OF SUSTAINED IMPROVMENT.
- BECOME A BETTER LEARNER; A SKILL THAT CAN BE APPLIED IN OTHER AREAS OF LIFE (E.G., ACADEMIC STUDY).

HOW DOES SKILL ACQUISITION BENEFIT THE CLUB?

- FACILITATE PLAYER RETENTION THROUGH INCREASED COMPETENCE AND ENJOYMENT.
- DESIGN MORE EFFECTIVE LONG TERM SKILL DEVELOPMENT PROGRAMMES.
- UNDERSTAND HOW TO BALANCE PLAY, PRACTICE AND MULTI-SPPORT PARTICITPATION.

Figure 3. **Some illustrative examples of the benefits of Skill Acquisition for coaches, players and clubs**

1.5 WHO DELIVERS SKILL ACQUISITION?

Unlike other disciplines (e.g., Athletic Development, Performance Analysis) where a specialist takes a leading role, **the coach is primarily responsible for applying the science of Skill Acquisition to practice.**

"Taking an interest in the Skill Acquisition research and applying it to my practice effectively has been important over the last number of years. What was most interesting was how to design effective practice – both individually and collectively – for players to develop their skill."
(Luke Barrett - Intercounty Coach, Donegal)

Coaches are not the only ones who benefit from understanding and applying Skill Acquisition. Players can also become more aware of what constitutes quality practice, and apply principles of Skill Acquisition to ensure that they are making the most out of every hour of practice. For example, a Skill Acquisition Specialist may review a free taker's individual practice and explore ways to make that practice more effective (see Section 2.2.2).

"I spent the next six weeks before the Roscommon game practicing frees in [a] manner which I now know was less than optimal or indeed effective"
(Gary Sice - Intercounty Player, Galway)

KEY MESSAGE:

SKILL ACQUISITION PROVIDES THE KNOWLEDGE BASE TO ENABLE THE COACH TO DELIVER MORE EFFECTIVE PRACTICE.

As will be outlined in section 3, coaches and players can find support for their application of Skill Acquisition from a range of sources including more experienced coaches, coach developers, sport psychologists and Skill Acquisition Specialists. A Skill Acquisition Specialist is a scientist with knowledge and experience in this branch of the sport sciences, who can advise and/or work with coaches, players, and other support staff to enhance player development at all stages of their journey in Gaelic games. As such, a Skill Acquisition Specialist has been defined as a "mediator" who can facilitate the translation and transfer of knowledge from scientific sources into coaching practice[11]. Both Skill Acquisition Specialists and Coach Developers with the relevant expertise can support a coach and/or player to consider what they are trying to achieve with a particular series of activities and to determine the best way to practice to achieve that goal. However, this will always be a supporting role: Skill Acquisition provides the knowledge base to enable the coach to deliver more effective practice.

Skill acquisition is primarily...

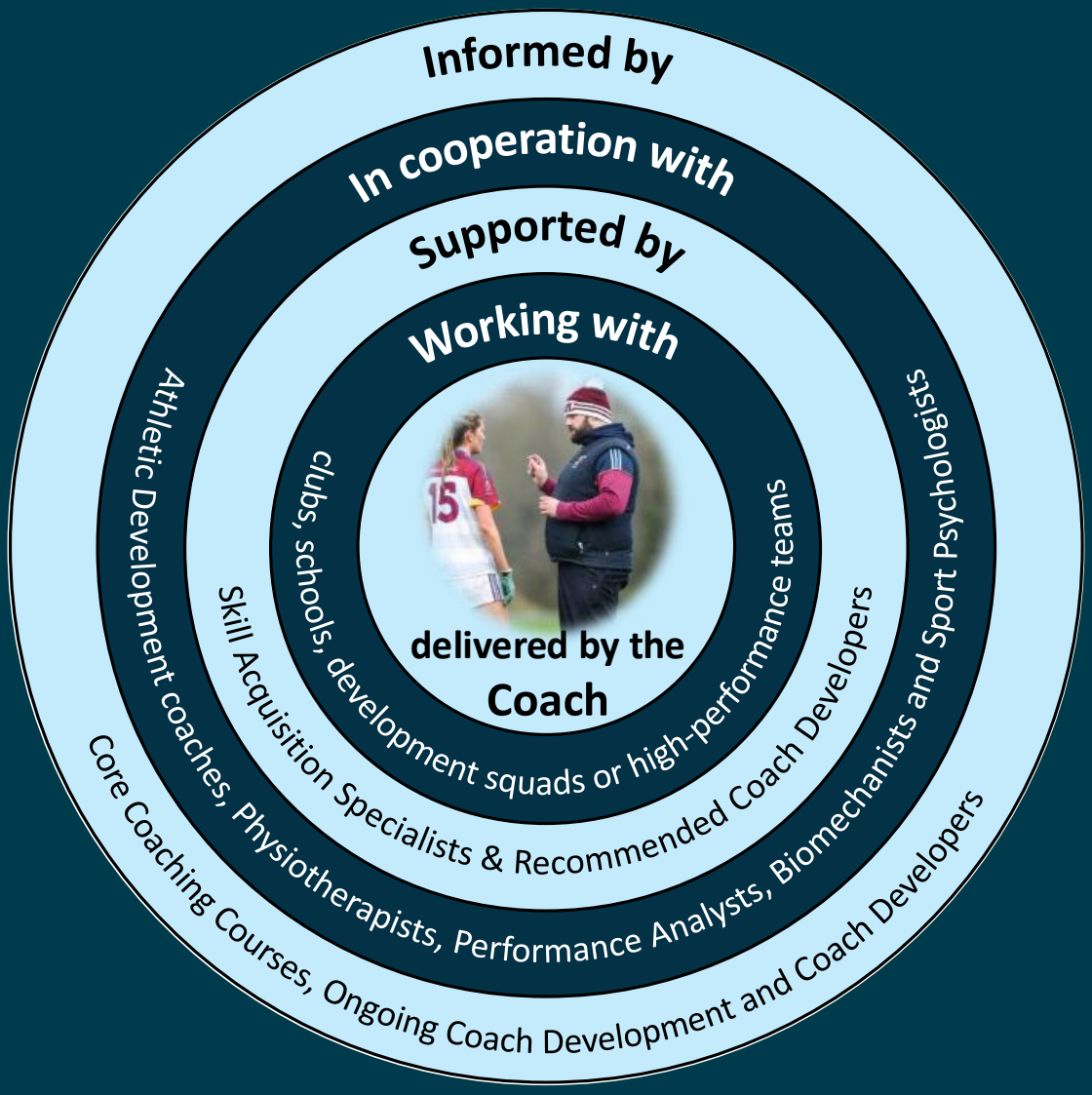


Figure 4. **Who delivers Skill Acquisition within Gaelic games**

2. HOW CAN YOU APPLY SKILL ACQUISITION IN YOUR COACHING / TRAINING?

"As a former player, the majority of training practices consisted of decontextualized practice tasks with very little decision making elements and in the main, focussed on performance outcomes. Skill Acquisition has influenced the way I coach in that it has given me a focus when designing sessions that challenge players to provide different solutions to different scenarios within the context of the game. Coaching through Skill Acquisition principles has helped me to provide a more engaging environment through variable practice, focussing players attention through problems and encouraging exploration to solve tasks. There are many ways to solve a problem!"

(Kevin Murray - Intercounty Player and Coach, Cork)

Effective learning environments are those which produce improvements in players' performances and which contribute to players retaining a love for the game. Team training sessions, individual training sessions, back garden play and video analysis sessions all fall within the remit of learning environments.

In this section we provide a range of examples of how the Skill Acquisition literature can guide a coach to design and deliver more effective practice. These examples illustrate how every coach, whether working with children, teenagers or adults, in a recreational or high-performance context, can benefit from an understanding of Skill Acquisition.

Before we provide these examples of how Skill Acquisition can inform your practice, it is important to consider *both player readiness and the role of unorganised sport*.

2.1 PLAYER READINESS

Figure 5. **Two players of the same age may be at different levels of development, even though they end up at the same place.**

Player Readiness is a crucial consideration within the delivery of Skill Acquisition[18]. For example, although two players may both be 15 years of age, what is appropriate for each in terms of the design of practice may be very different due to differences in their development and sporting experiences up to this point. These individual differences may include:

- Differences in **maturation**[41]: two children who were born on the same day, and who will eventually grow to the same adult height, may differ greatly in their size on any given birthday. Early maturing individuals (i.e., those who approximate their full adult growth at a younger age) and late maturing individuals may require different support to fully develop as skilful players.
- Differences in experiences due to their **local club and/or school environment:** depending on the amount and quality of coaching players have been exposed to, two 15-year-olds may have very different 'training ages'. The term 'training age' refers to how long a player has participated in regular, organized sports training[19]. How a player responds to different activities (e.g., individual practice, video analysis) may be very different depending on their training age.
- Differences in their **experiences of other sports and unsupervised sport**: an appropriate level of diversity in sporting experiences during childhood and early adolescence has been linked withbenefits later in their development[20,21]. For example, more unsupervised play has been linked with the development of creativity[22], suggesting that coaches interested in promoting creativity should consider whether any players have a 'play deficit' in their developmental history which might need to be addressed. The sporting history of two teenage players can be helpful in understanding current performances and help in devising appropriate interventions.
- Differences in their **current motivations**: two players who will eventually dedicate themselves to the pursuit of excellence and representing their senior club side may have very different motivations at age 15. While one player has already committed to that goal and embraced the work required, that spark may not have lit yet within the other player. Such variation in the readiness to fully invest in specialised intense training is normal within individuals who ultimately progress to the highest performance level as adults[23], as the following example from All-Ireland winning Tipperary hurler Lar Corbett's autobiography illustrates:

"As a young lad I was all over the place...lackadaisical about sport. In a county where hurling is king it was great pocking the ball around but when it came to playing games, I wasn't much bothered...I played on and off for Dúrlas Óg. In 1996 we reached an under-14 Mid-Tipperary final, which should have been a big enough deal at the time. And yet it wasn't important enough to prevent me taking the day off and heading to Tramore. A few of my pals were bound for the beach...and I tagged along. I hardly gave the match a second thought.
When the team mentors called to the door, my long-suffering mother, Breda, had to tell them I wasn't around."

Because of this variability in player readiness, this document does not outline age-related prescriptions for Skill Acquisition delivery, but instead provides an illustrative set of general examples for coaches to reflect upon.

Figure 6. **Unorganised sport has many benefits for young players.**

The role of unorganised sport.

While a coach willl coach will spend most of their time designing, delivering and reflecting upon organised training sessions within a club. However, as detailed in the **Gaelic Games Player Pathway and Sports Science 2030 Vision**, young children should spend as much time in minimally supervised playing of sport (i.e., back garden, school playground) as they should in organised training sessions. Such play has been connected to a host of motivational and skill development benefits[20,22], and is a prominent feature in the life stories of successful players:

"There was no pressure on us as kids, playing football in the back garden, no sense of 'You have to play for Kerry'. We enjoyed ourselves and knocked plenty of craic out of it – home from school, get the homework done, out the back kicking ball for hours. Every day."
(Tomás O Sé - Intercounty Player and Coach, Kerry)

"When I was a kid, it was a straight run to the hurling field from our house...I used to walk there in the summertime with my hurley and a bag of sliotars to practise free-taking or to workshop different goal-scoring scenarios"
(Eimear Ryan - Intercounty Player, Tipperary)

Thus, coaches should remember to encourage this free play in their conversations with players; this can be as simple as inquiring about where children engage in unorganised sport and reminding them, where necessary, of the value of playing with friends, neighbours and classmates. Finally, should a coach realise that there is little or no opportunity for unorganised sport or free play, they can always include some in their practice design when the kids are not doing anything specifically coach-led, but have access to equipment without direction.

2.2 EXAMPLES OF HOW A KNOWLEDGE OF SKILL ACQUISITION CAN BE APPLIED BY COACHES

Below you can find a range of examples of how Skill Acquisition might support coaches, players and/or clubs. Aligned with the Gaelic Games Player Pathway & Sport Science 2030 Vision, the interaction between the Player, the Environment and the Game should be considered when implementing the following examples (Figure 7).

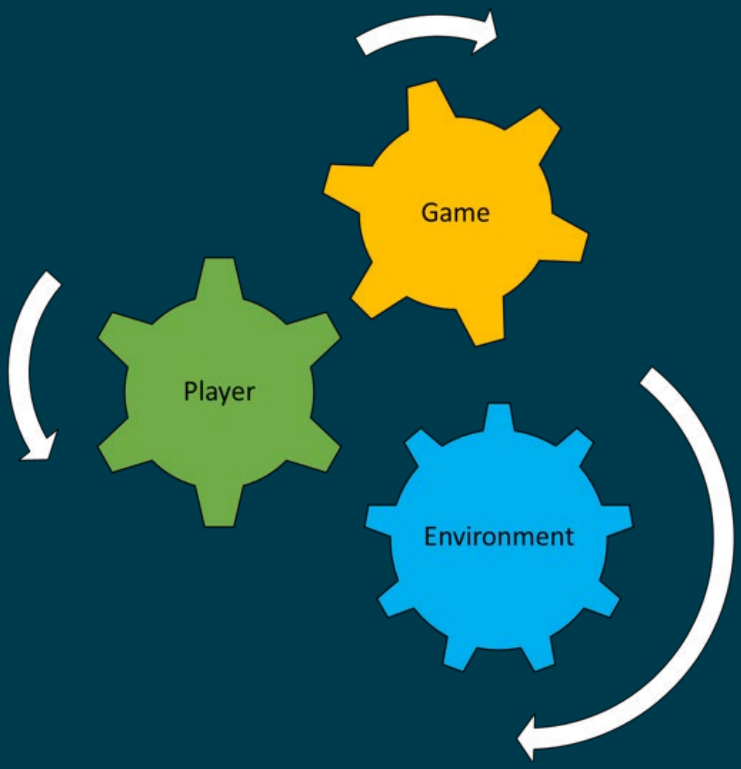


Figure 7. **The Player, the Environment and the Game**

2.2.1 APPLYING SKILL ACQUISITION TO SUPPORT COACHES

Drawing upon the extensive evidence base that exists within the scientific literature, a coach may develop many aspects of their training session design and delivery, including:

- How to organise practice repetitions to gain maximum skill learning.
- How to sequence practice activities within and across sessions.
- How to use instruction, questioning and feedback to optimise the learning experience.
- How to set the optimal level of difficulty to achieve the session's aims.
- How to develop and implement skill assessments appropriate to the player group.
- How to develop sessions that represent all aspects of the sport, thereby maximising the likelihood of practice transferring to performance.

It is important to stress that Skill Acquisition can provide support for coaches working at all stages of a player's journey in sport. As such, the first example will focus on how Skill Acquisition might support coaches working to enhance children's basic movement competence.

Example Problem: Designing a programme to enhance children's basic motor competence

The term 'basic motor competence' refers to the ability to move effectively[24]; when playing a game of chasing, can a child accelerate through a gap to escape their pursuer? When landing from a jump, can an adolescent bend their hips, knees and ankles to distribute force safely? When striking a ball from standing or running, can a child find a balanced position at the moment of contact? Motor competence does not mean that all children should demonstrate the exact same movement patterns at the same age; rather, a competent child is one who can move about safely and efficiently, adapting their movements to complete the tasks they are trying to perform (run after or away from another player, strike a ball, land from a jump, catch a ball, etc).

As part of an overall approach to developing physical literacy, it is important that children and youth develop sound basic motor competence from a health, education and performance perspective[25]. As such, Gaelic Games coaches may decide to design a basic motor competence programme for players, specific to the squad they are coaching (e.g., U-10 Camogie Club team, U-17 Inter-County Gaelic Football team).

This example will consider a three-phase approach to developing such a programme:

- Phase 1: Reviewing existing practice to ensure that children are experiencing a suitably broad range of movement challenges.
- Phase 2: Confirming the 'coach's eye' – ensuring that coaches understand what and how to evaluate children's movement to plan optimal activities and interventions.
- Phase 3: On-going monitoring and problem-solving as the coaches take ownership for evolving the programme.

Phase 1: Coaches can begin by reviewing guidelines on the broad range of movement experiences that children should experience, such as those hosted on Tobar: https://learning.gaa.ie/.

There are three categories of movement where all children can develop competence (see Figure 8): (i) locomotion (different ways of moving around in the world such as running, jumping and hopping); (ii) object manipulation (catching a sliotar, kicking a football); and (iii) stability (finding a balanced position when performing skills such as landing from a jump or changing direction)[c].

To facilitate their long-term participation in sport and physical activity, it is important that children experience variety both in terms of the movements they make (e.g., dodging, jumping, pushing) and how they make these movements (i.e., throw a range of different shaped and size balls varying distances using a variety of different types of throws).

LOCOMOTOR (Movement)

- Running
- Jumping (for height / distance / one leg to another)
- Hopping
- Leaping
- Skipping
- Swinging
- Side stepping
- Dodging
- Galloping
- Climbing
- Crawling

OBJECT CONTROL (Manipulation)

- Catching
- Overhand throw
- Underhand throw
- Punt kicking (kicking a ball from hands)
- Striking with an implement
- Two handed strike
- Hand dribbling (bouncing)
- Foot dribbling
- Kicking
- Chest passing

BODY CONTROL (Stability)

- Rolling
- Twisting
- Turning
- Rotating
- Landing
- Stopping
- Stretching
- Balancing on one foot
- Walking on a line or beam

Figure 8. **Indicative movement skills for locomotor, object control and stability categories**

"Observations of what the child does do at various developmental stages, does not totally answer the question of what he could do if we knew enough to set the conditions of his environment to stimulate the emergence and practice of movement patterns."
(Lolas Halverson)

Phase 2: Knowing where, when and what to look for is an essential skill for a coach, often referred to as the coach's eye. Acknowledging that children develop at different rates, it is important that coaches understand what features of a developing child's movement are important to note. Skill Acquisition resources, a Skill Acquisition Specialist or Coach Developer will be able to guide coaches to develop their coach's eye.

Careful observation of their sessions can then guide coaches to modify their practice activities to present an appropriate challenge for the young learners. Examples of key movement features to observe include:

- When **landing** from a jump, does the child contact the ground on the balls of their feet and bend their knees to absorb the force of landing?
- When **dodging** other players, does the learner sidestep off of both their right and left foot?
- When **throwing**, does the player take a step forward with the foot opposite the throwing hand so as to shift their weight from back to front?

Remember, skill is movement adapted to context. This has two important implications for assessment:

1. **Throwing**: If the context does not require a forceful throw, then a child may not take a step forward because they can be successful without including this movement. As such, activities should be carefully designed to ensure that they are inviting children to move in effective ways.
2. **Striking**: A child may exhibit a poor striking action because their hurley is too heavy; having a variety of equipment available for children to try provides greater opportunities for them to reveal their potential and gain the motivation to keep on practicing.

Phase 3: Once coaches have developed an awareness of the diversity of movements that children should be exploring, and have calibrated their coach's eye, they will be able to decide on which specific motor skills might be needed in future coaching practices (e.g., more jumping activities in the warm-up; a broader range of objects to practice catching). The coach's focus now turns to monitoring (e.g., are players finding the new activities engaging) and evaluating (i.e., is it working - have the players' basic motor competence improved?).

Figure 9. **Example of dynamic stability warm up activity for coaching integration**

[b] While this example focuses on movement skills like jumping and catching, a well-rounded basic motor competence programme will also consider foundational game skills such as tracking or evading another player or timing a run which can be observed and developed within basic games such as tag (chasing). While the concept of game skills[26,27] is less well-defined than movement skills, game skills are an essential ingredient of a well-rounded basic motor competence programme.

2.2.2 APPLYING SKILL ACQUISITION TO SUPPORT PLAYERS

"I wanted to sharpen up my decision making on the field and worked with a Skill Acquisition Specialist to improve this area of my game. We ran through some innovative yet relatively simple exercises that were designed to increase reaction times whilst making the right decision. I really felt the benefit of these sessions looking for those extra inches that can help you excel"
(Chris Barrett - Intercounty Player, Mayo)

Improving the skill levels of individuals is a key step to improving the performance of a team. Coaches, and on occasion a Skill Acquisition Specialist, can provide direct support to a player. Often this more individualised support will involve enhancing the quality of practice behaviour, whether in the context of team training or individual training outside of team sessions. Examples of situations where Skill Acquisition might be used to develop an individual player include:

- Developing an **effective eye gaze strategy**: What a performer looks at, and the timing of when they look, often differentiates expert from good performers, and successful from unsuccessful attempts in both static (e.g., free kick) and dynamic (e.g., passing in open play) situations. The pattern of where and when someone picks up information is referred to as their eye gaze strategy. While specialist equipment is required to measure a player's eye gaze strategy, the Skill Acquisition literature describes straight forward interventions which any coach can implement with individual players[28,29].
- Exploring **dead ball practice**: Free takers often complete additional practice outside of team sessions. This practice should be designed in such a way to ensure that any improvements seen also appear within competition. Coaches can apply guidelines from the Skill Acquisition literature to ensure that players are being as efficient and as effective as possible in these additional sessions.
- Developing **Practice Intelligence**. The concept of game intelligence is well-known within invasion sports such as Gaelic games, describing a player who moves efficiently on the field of play to maximise their impact on the game while minimising unnecessary movement. A player with high levels of *Practice Intelligence* maximises their learning from practice sessions by drawing upon a range of strategies (e.g., setting specific process goals, utilising imagery and self-talk, seeking feedback, focusing effectively, among others[6,30]). Coaches can draw upon the Skill Acquisition literature to ensure that players are practicing intelligently to maximise their learning.
- Addressing a **technical 'bad habit'**. 'Bad habits' refer to movement patterns that are long-practiced and well-established, but problematic. For example, their use may predispose a player to an injury, or limit their performance. However, because they have been performed by the player for so long, they are very difficult to alter. The Skill Acquisition literature provides detailed guidance for coaches seeking to address such a 'bad habit'[31].

Example problem: Using ASPIRE to design deliberate practice activities

Not all practice is equally effective. Deliberate practice refers to a particular way of engaging in practice, the goal of which is to improve a particular component of performance[6,32]. Understanding when and how to implement deliberate practice provides a powerful tool to accelerate a player's learning.

The ASPIRE model[32] (Analyse, Select, Practice, Include feedback, and Repetition, Evaluate) outlines six steps to encourage deliberate practice:

- **Analyse** – Compare the current performance of the player to benchmarks based on the performance of age appropriate models.
- **Select** – Identify the main limiter to improved overall (long term) performance. Select the most appropriate approaches for practicing that key aspect. Determine appropriate short- and longer-term goals.
- **Practice** – Design and run practices in which the performer practices the key aspect of performance determined using information from the previous two steps. These practices should contain suitably challenging conditions and may involve individual practice or be integrated into team training sessions.
- **Include feedback** – Monitor practice carefully. Based upon your observations, manipulate the challenge of the practice activities as required. Ensure the athlete can engage with informative feedback through either a conversation with the coach or implicitly through their performance of the task.
- and **Repetition** – Include repetition of the key aspect of performance; ensure that this repetition incorporates suitable levels of variability and occurs in contexts that are highly representative of the competition environment when appropriate.
- **Evaluate** – Analyse current performance to determine whether additional practice is required, or sufficient progress has been made and it is time to move onto new aspects.

Table 2 provides an example of the application of ASPIRE within Gaelic Games:

Step	Activity
1. Analyse	Review a player's performance in relation to a recent number of matches or scenarios.
2. Select	It becomes clear that the kick pass is the most important limitation within this player's performance as it has been regularly responsible for turning over possession in match situations.
3. Practice	Design a series of scenarios in match-like conditions where the kick pass is frequently an appropriate option; i.e., few players in a large playing area.
4. Include feedback	Allow the play to unfold a sufficient number of times to ensure an appropriate number of skill attempts have been executed, thereby giving the coach and player enough examples to either have a discussion about where, when, and how the kick pass is being used, or to allow the player to reflect on their progress.
5 Repetition	Following a brief discussion, where ideally the coach will engage the player through questions to assess and if needs be to heighten their self-awareness of their skill, the player returns to the playing area to experience more opportunities of the skill however they may unfold. It is important in this phase that the skill is not isolated from the reality of a game situation and is the rules of the game are such that many executions emerge over the course of the practice.
6. Evaluate	The coach and player discuss how the skill is developing. The scenario may need to be adapted or progressed to suit the evolving skill level of the player. Ideally, the suggested changes will come from the player through the guidance of the coach.

2.2.3 APPLYING SKILL ACQUISITION TO SUPPORT CLUBS, SCHOOLS OR SQUADS

Sustained effective player development is rarely the result of an individual coach acting in isolation, but the product of a community that interacts to create a rich environment for players. While our focus thus far has been on how Skill Acquisition can enhance the quality of individual practice sessions, research on the long-term retention and development of players has generated principles which can be applied at the level of the club or school or squad. Case studies of effective youth development organizations[33,34] provide valuable guidance on how such communities may be evaluated and developed.

As with the other sections, there are a range of resources which coaches can draw upon to generate new ideas for their practice. These resources include books, podcasts, webinars, research articles and discussions within a coach's community of practice or with Coach Developers or with Skill Acquisition Specialists. These resources might guide a Club to:

- Develop a strategy to deliver effective feedback for players in a coherent way across different ages and stages of development.
- Evaluate and develop methods which are used to assess skill across various development squads.
- Analyse player progression data (e.g., what proportion of Under-12 players progress to Under-16; what proportion of senior players participated at minor level).
- Identify how Skill Acquisition might inform the role of a Youth Section Lead or Club Coaching Officer.
- Conduct a comprehensive audit of the players' journeys within a development squad. This audit would consist of observing practices and games, discussions with relevant individuals (e.g., players, coaches, committee members, support staff, parents), and reviewing any relevant documentation (e.g., guidelines for coaches, information for parents and players). The audit would be used to facilitate a review of current practices and the development of an action plan to enhance the development environment and processes.

If engaging a Coach Developer or Skill Acquisition Specialist to assist with any of the above, the duration and depth of involvement with an organization can vary. Workshops (incorporating both classroom and on-field elements) are a valuable means of raising awareness of specific topics, and of encouraging coaches to explore new ways in which they might apply the science of Skill Acquisition in their practice. However, workshops are also limited in their capacity to influence long-term development of players and coaches. Longer term interactions such as embedding with the coaching team over a season or completing an audit of the organization might also be appropriate.

Example Problem: Developing skilful learners

Context: Two players can attend training for the same number of hours but make very different levels of progress. If one player is focused on their learning and the other is just going through the motions, we would expect the former to progress much more than the latter. However, there is more to effective practice than just paying attention and trying hard. Top players use a range of strategies (including imagery, managing the degree of difficulty, setting process goals, repetition without repetition, and self-monitoring) to enhance the quality of their practice, and to accelerate their learning. This workshop encouraged coaches to consider how the players they are working with are currently demonstrating, and can be encouraged to develop, these effective learning strategies. As such, it served to identify and confirm elements of current best practice and identify areas for coaches to explore in their future work. While this workshop was delivered by a Skill Acquisition Specialist, it could equally be run by a Coach Developer or a group of coaches within the context of a community of practice.

Workshop structure: A 90-minute online webinar had coaches from an inter-county academy (dealing with players aged 14-18 years) working in small groups to examine and share their understanding in relation to the following questions:

1. What does a player engaging in high-quality practice look like in your context?
2. What do you currently do to evaluate and develop players who engage in high quality practice behaviours?
3. What might you do differently in future?

Coaches' responses were compared to findings from research and from other relevant groups (e.g., equivalent settings in another sport) to stimulate further reflection on current practice.

Six weeks post workshop, coaches had a follow up meeting to comment on:

1. Any further characteristics of high-quality practice that they had noticed in their groups since the initial awareness-raising workshop.
2. Any changes to their practice they had experimented with.
3. Any questions they had about the topic of high-quality practice.

2.3 RESEARCHING SKILL ACQUISITION

A wide range of research relating to Skill Acquisition relevant to Gaelic Games has been undertaken and is on-going within the Irish context. The list below is not exhaustive, but illustrates the range of institutions and examples of projects which are being undertaken across youth and high-performance sport:

Children's Basic Motor Competence

Behan, S., Belton, S., Peers, C., O'Connor, N. E., & Issartel, J. (2019). Moving Well-Being Well: Investigating the maturation of fundamental movement skill proficiency across sex in Irish children aged five to twelve. *Journal of Sports Sciences*, 37(22), 2604–2612.

Bolger, L. E., Bolger, L. A., O'Neill, C., Coughlan, E., O'Brien, W., Lacey, S., & Burns, C. (2019). The effectiveness of two interventions on fundamental movement skill proficiency among a cohort of Irish primary school children. *Journal of Motor Learning and Development*, 7(2), 153–179.

Kelly, L., O'Connor, S., Harrison, A. J., & Ní Chéilleachair, N. J. (2021). Effects of an 8-week school-based intervention programme on Irish school children's fundamental movement skills. *Physical Education and Sport Pedagogy*, 26(6), 593–612.

O'Connor, S., Whyte, E. F., Gibbons, B., Feeney, O., Luc, S., & Ní Chéilleachair, N. (2018). Fundamental movement skill proficiency in juvenile Gaelic games. *Sport Sciences for Health*, 14, 161–172.

Peers, C., Issartel, J., Behan, S., O'Connor, N., & Belton, S. (2020). Movement competence: Association with physical self-efficacy and physical activity. *Human Movement Science*, 70, 102582.

Modifying Youth Sports Provision

Gavin, K., Taylor, J., Behan, S., Horgan, P., & MacNamara, Á. (2024). Participant experience of a modified sports program – A curriculum investigation in Gaelic games. *Youth*, 4(1), 15-30.

Sheridan, D., Coffee, P., Daly, P., & Lavallee, D. (2020). 'Here, you're all good enough to play': lessons learned from the GAA Super Games Centre. *Sport and Exercise Psychology Review*, 16(1), 86-93.

Quality Practice

Coughlan, E. K., Williams, A. M., & Ford, P. R. (2019). Lessons from the experts: The effect of a cognitive processing intervention during deliberate practice of a complex task. *Journal of Sport and Exercise Psychology*, 41(5), 298–308.

Bilateral Skill

Dillon, K., Kinnerk, P., Sherwin, I., & Kearney, P. E. (2022). The development of bilateral skill symmetry: Insights from Gaelic football players and coaches. Journal of Motor Learning and Development, 10(2), 273–289.

Murray, K., Burns, C., Lacey, S., O'Neill, C., & Coughlan, E. K. (2023). An examination of bilateral skill proficiency and frequency of pass in selected and nonselected youth academy Gaelic footballers. *Journal of Motor Learning and Development*, 11(3), 480–496.

Practice Activity Selection & Sequencing

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.

O'Brien, W., Hogan, I., & Coppinger, T. (2022). Coaches' experience of the "Gaelic4Teens" program in Ireland. *International Sport Coaching Journal*, 10(1), 70–77.

Relative Age Effects

McGonigle, P., Paradis, K. F., & Hancock, D. J. (2023). Longitudinal relative age effects in youth soccer and youth Gaelic football in Ireland. *Journal of Human Sport and Exercise*, 18(3), 563–575.

Queeney, J. R., Kelly, A. L., McGourty, P., & Horgan, P. (2022). The relative age effect in the Gaelic Athletic Association (GAA): A mixed methods approach. *Science and Medicine in Football*, 7(3), 242–252.

3. HOW CAN A SKILL ACQUISITION SPECIALIST OR COACH DEVELOPER WITH A FOCUS ON SKILL ACQUISITION HELP YOU TO ENHANCE YOUR PRACTICE?

"Working with Alan as our Skill Acquisition Specialist completely changed the thinking behind Ballintubber football. Alan supported us in training session design, led a coaches clinic and acted as a sounding board for our coaches throughout the year which proved invaluable. Our training transformed into challenging and always stimulating sessions. Players were consistently working under intense pressure and making decisions in game-based scenarios which was a welcome departure from "what had always been done".

After a number of months, the transformation to the field of play became very evident across our adult teams. On the individual player level, we saw huge progress in skills acquisition from Alan's player skills testing, player pod sessions and 1:1 conversations. From working with a Skill Acquisition Specialist we are sure to reap the benefits as a club for years to come."

A coach does not need to engage a Skill Acquisition Specialist to apply Skill Acquisition; a range of resources exist which can help a coach to evaluate, confirm and develop their practice (see Section 6). However, as demonstrated in the testimonial which opened this section, interacting with a Coach Developer with expertise in your area of interest or a Skill Acquisition Specialist may accelerate your development. The end goal of applying Skill Acquisition is to enable a coach to make better decisions for their players, a player to make better decisions about their practice, or a club to make better decisions for their members.

"it's about meeting people where they are and helping them start at that point to develop new knowledge or implement some of the research ideas. And it's evolving our understanding - so it's not me trying to translate some of the research across to a coach; it's about working with that coach to develop our evolving understanding of what learning can look like."

– Dr Ross Pinder (Skill Acquisition Specialist with Paralympics Australia)

A Skill Acquisition Specialist or Coach Developer may be brought in to consult in a variety of ways. At the most intensive level, they could be an integrated member of the support team, attending all training sessions and competitions and liaising with coaches, athletic development coaches, performance analysts and sport psychology to orchestrate an optimal learning environment for the players.

Alternatively, the Skill Acquisition Specialist or a Coach Developer with relevant expertise might just work with a coach outside of training sessions in relation to specific topics (e.g., session sequencing; delivery of feedback), or work with a player in relation to making the most of their individual practice time. One off sessions such as a workshops for coaches, other sport science staff or parents, can also have value, although their impact may not be sustainable without sufficient follow-up.

This section first differentiates the work of a Skill Acquisition Specialist from that of an experienced coach or coach developer. Second, it outlines a general model which a coach, Coach Developer or Skill Acquisition Specialist might use to structure their application of the science. Finally, it provides a series of specific examples of how coaches, players and/or clubs might utilise Skill Acquisition.

3.1 DISTINGUISHING THE SKILL ACQUISITION SPECIALIST FROM THE EXPERIENCED COACH

Seeking guidance in relation to effective practice from an experienced coach is likely to cover many of the same topics raised by a Skill Acquisition specialist. A key difference between the experienced coach and Skill Acquisition Specialist is the extent to which the latter draws upon research to guide their interaction with the coach or player. To be clear, many high performing coaches do utilise research to inform their thinking. For example, when considering how best to communicate with children or how to encourage adolescents to take ownership of their learning, many high performing coaches and Coach Developersact in a way that is consistent with the latest research and theory. Furthermore, they can explain the core principles of that research and theory. Nonetheless, the Skill Acquisition Specialist can be expected to have a broader and deeper knowledge of the scientific research across a range of topics.

Due to the nature of their role, an experienced Coach Developer can also be expected to have a greater knowledge of the research on skill acquisition than many coaches. However, as a coach developer must be able to assist coaches in many areas, not just Skill Acquisition, their knowledge of Skill Acquisition is likely to be more focused than that of a Specialist in the domain.

When approached with a specific problem, such as enhancing a team's decision-making, a Skill Acquisition Specialist can be expected to draw upon their knowledge of appropriate strategies from the research literature to identify a range of options. To continue the decision-making example, the Skill Acquisition Specialist might consider: (i) ensuring the conditioned games being used sufficiently reflect game scenarios; (ii) capturing players' thoughts during training games by recording them as they 'think aloud' to further understand what is happening; (iii) reviewing how video analysis is being used to supplement on-field training; or (iv) integrating a number of these methods into a multi-stage intervention, guided by previous case studies[12-14]. Through conversations with the coaching team, an appropriate option is selected and adapted to meet the needs of the specific context. Thus, a Skill Acquisition Specialist does not replace the coach. Just as a performance analyst provides greater clarity as to what is happening on the pitch, so a Skill Acquisition Specialist provides greater clarity as to how to design practice in response to what is happening by presenting the evidence or best practice principles for a coach to consider as they strive to accelerate the development of players.

3.2 A MODEL TO GUIDE COACHES ENGAGING WITH THE SCIENCE OF SKILL ACQUISITION

In this section we outline a model for applying Skill Acquisition to enhance the quality of practice. The general process described will be familiar to anyone who has worked with a Coach Developer. This model can be adapted for a coach engaging with the Skill Acquisition literature, for a group of coaches forming a community of practice, or for a coach working with a Coach Developer or Skill Acquisition Specialist in a consultant-type role. The model, presented in Figure 9, borrows heavily from the Skill Acquisition Servicing Approach of the Australian Institute of Sport. It is not intended as a prescription that all coaches and Skill Acquisition Specialists should follow, but instead illustrates for coaches, players and/or clubs what they might expect when employing the science of Skill Acquisition.

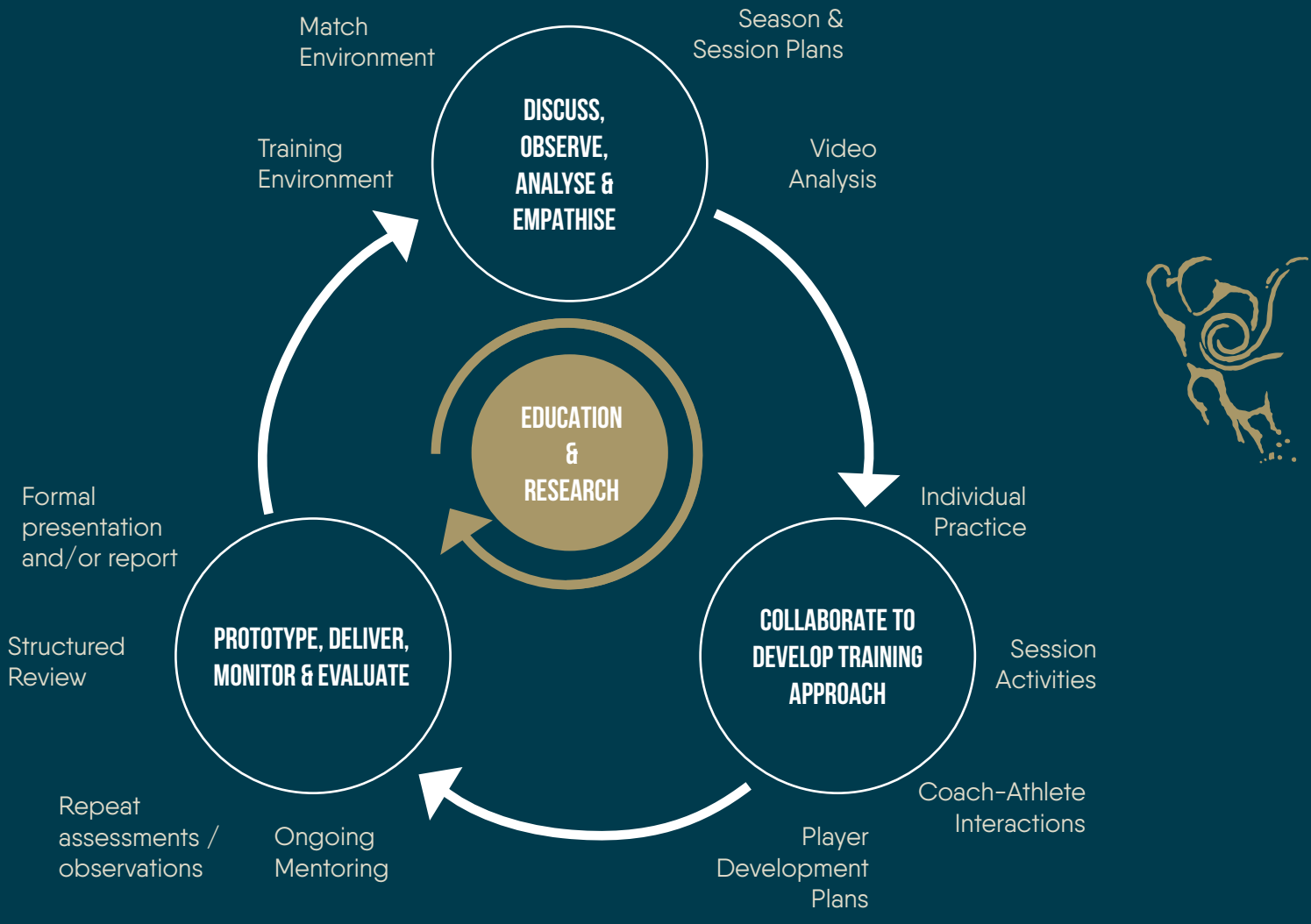


Figure 9. **A general model of Skill Acquisition service delivery (adapted from the Skill Acquisition Servicing Approach of the Australian Institute of Sport & Askew et al.[15]).**

[d] While this example describes working with a coach, it could equally refer to working with a player or a club.

DISCUSS, OBSERVE, ANALYSE & EMPATHISE

A problem-based approach is often followed when applying Skill Acquisition. A coach may have identified an area where they could improve, or if engaging a Skill Acquisition Specialist or Coach Developer in a consultancy role, the consultant first works in partnership with the coach[D] to identify an area in need of support. This might involve a "Practice Audit", where the consultant may come in without a specific need identified and begin with a blank slate to observe and identify topics for discussion. Alternatively, the coach may have already identified a potential problem area where they desire support, and the initial phase focuses on verifying the root cause of the issue.

Having established preliminary goals and an initial understanding of the process, the next stage is an extensive observation of the planning and delivery of training and/or competition. The outcomes of this evaluation are carefully analysed in light of research and the specific context, before priority areas are identified. Integral to this stage is empathy: understanding not just what coaches and players are doing in this specific context, but also why they adopt this approach.

COLLABORATE TO DEVELOP TRAINING APPROACH

There is not a single correct way of doing everything in coaching. Skill Acquisition can guide a coach to consider evidence-informed options and to encourage them to critically analyse their current practice in relation to that evidence, then designing a training approach to address the identified needs. By engaging with the Skill Acquisition literature, or with a Skill Acquisition Specialist or Coach Developer, the coach can identify how to enhance their approach to training:

- Players in the Foundation 3 phase of the Gaelic Games Player Pathway are not taking the opportunity to play kick passes when they arise –the coach designs a progressive series of conditioned games which initially make the opportunity to kick pass more obvious.
- An U21 goalkeeper at the Talent 4 phase is demonstrating one specific flaw; her positioning is poor when multiple players are converging on the goal. Therefore, the coach reviews training session designs to ensure that the goalkeeper is gaining sufficient opportunities to practice the situations which arise during matches.
- Adult club players at the Foundation 3 phase are not able to adapt to novel opposition strategies within games –the coach reviews how they are promoting problem solving and player ownership during sessions (e.g., reviewing amount and quality of questioning; reviewing design of training activities).
- There is a very large variation in the physical development of players within the U15 age grade – the training times for the U15 and U17 team are arranged

to overlap; within this overlap period, 15 minutes is spent in mixed-age grade games to physically challenge some of the early developing U15 players, and to provide leadership development opportunities to some of the late developing U17 players.

- Within training sessions, a group of U10 camogie players in a local club setting (Foundation 2) are focusing a lot of their attention on striking activities (both long distance and short distance) only. The coaches reflect on how they might provide a more 'well-rounded' motor skill focus within training sessions, by implementing activities that also target locomotor and stability movements.
- Adult intercounty (E1) players are failing to deliver in pressurised situations – the coaching team reviews both the design of session activities (e.g., 'are we simulating pressure?') and the feedback that they provide (e.g., 'are we predisposing players to overthink scenarios?') to ensure that both are facilitating robust performance under pressure.
- The new intake of players into the Foundation 1 nursery programme could benefit from additional attention towards their basic motor competence – the coaching team create a handout of 'activities to play at home' as a resource for any interested parents.
- An U17 (T3) player cannot break a technical "bad habit" – the player and coach work together to design a progressive programme of activities to refine the problematic technique.

To develop their understanding of any of the above scenarios, a coach can engage with Skill Acquisition research through books, journal articles, podcasts and workshops (see Section 5 and References). A coach can also engage support from a Coach Developer who has specialised in this area or a Skill Acquisition Specialist. If a coach is being assisted by a Skill Acquisition Specialist or Coach Developer, then it is vital to view that interaction as a collaboration. While the Skill Acquisition Specialist brings expertise in relation to learning, the coach brings expertise in relation to their context (e.g., what are our resources), history (e.g., what have we tried before) and aims (e.g., what is most important to us). The Skill Acquisition Specialist guides the coach to consider a broader range of options in relation to what practice might look like, but ultimately, the coach decides and implements the options they feel will best work for the players.

PROTOTYPE, DELIVER, MONITOR & EVALUATE

Learning is complex; the first solution that a coach devises may not work as well as they hoped. An initial solution (prototype) might need to be trialled to better understand how it can best be implemented in the specific context and refined over several cycles before being fully implemented.

A vital element of applying Skill Acquisition is appropriate measurement: (i) is the intervention being delivered as designed? (ii) is the intervention working?

To answer the question of whether the intervention is being delivered as designed, careful consideration should be given to not just outcomes (e.g., Are players making better decisions about where to shoot from? Are children making good contact with the sliotar on more swings?), but also to the process. For example, does everyone who has a role to play in the intervention (e.g., assistant coaches, players, parents, etc) understand what the intervention is about? What do players think about the intervention? Monitoring such information gives the

intervention the best chance of working. To answer the second question, tests of skill are often developed with the coach (and, where available, the performance analyst) based upon the age, stage of development and specific demands of the sport[16,17]. Two points are important to consider here. First, the ultimate test is whether improvements show up in competitive games, but (a) such matches might not give a player many chances to demonstrate the skill they have been working on, and (b) ideally, we'd like to know if an intervention has worked before we get to a competitive game. The design of an appropriate test needs careful consideration[36]. Second, skills can take time to be developed; sometimes players can be learning despite showing little progress – that learning is revealed when everything 'clicks' and there is a sudden marked improvement in performance. Skill Acquisition takes time and it benefits from patience and having a good attitude while waiting.

EDUCATION & RESEARCH

The coach is primarily responsible for the delivery of Skill Acquisition. If working with a Coach Developer or Skill Acquisition Specialist on a bespoke project, the coach has an opportunity to both address a specific issue and to upskill in relation to core principles of Skill Acquisition. This upskilling may not only refer to the coach; players and other sport scientists can also potentially learn more about the science underpinning quality practice from the intervention. Skill Acquisition Specialists and Coach Developers are therefore encouraged to see the education of coaches, players and other sport scientists as a core component of any intervention. Skill Acquisition Specialists utilise a scientific, evidence-informed approach to address problems facing players and coaches. Applied case studies are an important part of the research evidence base, illustrating how research findings can be adapted to specific contexts. Consequently, to facilitate the development of the discipline and as a means of quality assurance, Skill Acquisition Specialists are encouraged to conduct research on their practice. As such, it is normal for coaches and players to be asked for their work with the Skill Acquisition Specialist to be incorporated into a research study[e] .

Summary

Aspects of the science of Skill Acquisition are mentioned in many coach education courses. However, such courses tend to provide only a brief introduction to core concepts. When coaches/clubs wish to further develop their knowledge in a particular area, or are faced with specific problems, the scientific literature on Skill Acquisition[7-9], a Coach Developer with the relevant knowledge base, or a Skill Acquisition Specialist may be consulted. When engaging with an individual to provide Skill Acquisition support, the model presented in section 3.2 can guide that interaction. The goal of such interactions, whether with a Skill Acquisition Specialist or Coach Developer, is neatly captured in this testimonial from a coach:

"I think my coaching's changed; he [Skill Acquisition Specialist] helped me actually just believe in myself a little bit more. There're some things that I play around with my coaching and having a stamp of approval from him in making me believe that that's the way forward...I think we [as coaches] get caught up in doing the volume day after day and we don't look at the detail of it"[10]

[6] Such studies should be subject to ethical approval from a relevant organization such as a University Research Ethics Committee.

4. HOW TO IDENTIFY A SKILL ACQUISITION SPECIALIST TO SUPPORT YOUR PERFORMANCE / YOUR CLUB / YOUR COACHING.

As we have emphasised throughout this document, the science of Skill Acquisition can guide a coach to promote players' skill development by designing more effective practice activities, providing more effective feedback, etc. On occasion, a coach, player or club may wish to engage a Skill Acquisition Specialist to provide more bespoke guidance. Part of the remit of this document is to provide guidance in relation to quality assurance of those sport scientists working within the domain of Skill Acquisition. As such, this section outlines how to find and engage a Skill Acquisition Specialist.

4.1 IDENTIFYING POTENTIAL SKILL ACQUISITION SPECIALISTS TO SUPPORT YOU.

It is important to acknowledge that, unlike longer-established domains such as Sport Psychology and Athletic Development, a standard professional accreditation is not in place for Skill Acquisition Specialists within Ireland[f]. Practitioners working in High Performance Sport may hold accreditation from either the **Irish Sport & Exercise Sciences Association Accreditation** programme , or an international equivalent such as the **British Association of Sport & Exercise Sciences High Performance Sport Accreditation**. At present, both of these accreditation routes focus just on high performance sport . Consequently, Skill Acquisition Specialists can be also sourced from several areas:

1. Full time Skill Acquisition scientist with national/regional Institute of Sport or professional team.
2. Independent consultants.
3. Academics working as lecturers or researchers in higher education who have specialised in Skill Acquisition.
4. Accredited professionals (e.g., sport psychologists) or academics in other domains (e.g., motor development) who have specialist knowledge in aspects of Skill Acquisition.
5. Coach developers with advanced degrees in coaching science, who have specialist knowledge in aspects of Skill Acquisition.

Skill Acquisition Specialists will often be involved with Professional Networks such as **Movement & Skill Acquisition Ireland** or the UK-based **Expertise and Skill Acquisition Network**, and reaching out to the coordinators of such networks may be helpful in identifying potential sources of support. Such networks will facilitate contact with Skill Acquisition Specialists.

Colleges and universities that deliver sport science, physical education and/or coaching programmes will typically employ a staff member with a specialist knowledge of Skill Acquisition. Reviewing the staff profiles from higher education institutions will reveal the names of specialists who may be available to assist you.

Although Skill Acquisition Specialist is the recognised term in other countries, other professionals also could develop a specialism in Skill Acquisition in general, or in relation to specific groups. For example, an academic in motor development will be well-placed to advise on developing basic motor competence in children. Likewise, Skill Acquisition is an option for trainee sport psychologists to specialise in within their professional development. Thus, it may be worth inquiring of the sport psychologists on the **Sport Ireland Institute** Professional Accreditation Contact List.

[f] Professional accreditation does exist for Skill Acquisition Specialists in other countries; for example, in Australia through Exercise & Sports Science Australia: https://www.ais.gov.au/position_statements/best_practice_content/ais_sssm_practitioner_minimum_standards

4.2 WHAT ACCREDITATION/ QUALIFICATIONS SHOULD YOU LOOK FOR WHEN ENGAGING A SKILL ACQUISITION SPECIALIST?

In the absence of a standard accreditation within Ireland, anyone looking to employ a Skill Acquisition Specialist should consider three factors: Professional accreditation; Academic qualification; and Experience and references.

- **Professional accreditation:** the higher the professional accreditation that an individual holds, the more likely that they can successfully apply their knowledge within a particular context.
  - The strongest candidates will hold professional accreditation from one of the following bodies[g]:
    - Irish Sport & Exercise Sciences Association Accreditation
    - Psychological Society of Ireland
    - British Association of Sport & Exercise Sciences
    - British Psychological Society
    - Exercise & Sports Science Australia
  - Lower expectations should be placed on individuals who are currently working towards professional accreditation. However, as these individuals are actively supported by an experienced practitioner, they may be engaged with confidence.
- **Academic qualification:** the higher the academic qualification that an individual holds, the broader the knowledge base that you can reasonably expect them to hold.
  - The strongest candidates will hold a PhD. Established professionals (e.g., senior lecturers, established researchers or consultants) may be expected to have a comprehensive and up to date knowledge of a broad range of topic areas. Early career academics can be expected to have a narrower knowledge base.
  - MSc graduates may be expected to have a well-developed knowledge of specific topics.

The reason academic qualifications are sought after in all domains when searching for a specialist is because it increases the likelihood that an individual has been exposed to the importance of engaging in scientific rigour when developing an opinion on how best to guide someone else. It also suggests that they have developed the capacity to 'learn how to learn' which should ensure that they will stay up to date with emerging evidence and best practice.

- **Experience and references:** Skill Acquisition Specialists should be able to share a portfolio of prior cases studies along with supporting references. Skill Acquisition covers a broad range of topics, ranging from children's initial introduction to organized sport to decision-making withinhigh-performance sport. As such, different practitioners will be able to support different facets of Skill Acquisition. When recruiting, ask for evidence of past experiences relevant to your context.

[g] These bodies offer general accreditation as a Sport Scientist or Sport Psychologist rather than a specific Skill Acquisition accreditation. You will still need to ensure that the professional you are engaging has relevant experience in relation to your context.

4.3 EXAMPLE PROFILE

The specific recruitment process will depend on the nature of the role and the requirements of your organization. If advertising for a Skill Acquisition Specialist, it may be helpful to consider the following sections in the advertisement:

Table 3. Sections to consider when advertising for a Skill Acquisition Specialist

Section	Contents
Overview of the Organisation	Provide an introduction to the organization. What are you trying to achieve as an organization? What are the core values of your organization which you wish the successful candidate to align with?
Role Purpose	Who will the role-holder work with? What general outcome will the role-holder be working towards?
Key Performance Areas	Provide a more detailed checklist of tasks. For example: - Work in collaboration with coaches and performance scientists (performance analyst, athletic development coach, physiotherapist) to... - Design and deliver best practice Skill Acquisition support to coaches, players and performance scientists via...
Role Requirements	Detail those role requirements that are essential and desirable. Depending on the nature of the role, the level of professional accreditation, academic qualification, and experience should be specified. Consider how you will ask the candidate to demonstrate each of these requirements.

An example role profile is available from research paper number 43 in the references list.

4.4 WHAT SHOULD YOU EXPECT FROM A SKILL ACQUISITION SPECIALIST IN RELATION TO MONITORING AND REPORTING?

Reporting is an important element of all sport science service provision. In some cases, a Skill Acquisition Specialist may be part of the broader management team and will therefore contribute to the on-going planning and review process. In other cases, the Skill Acquisition Specialist may complete a discrete work package (e.g., evaluation of players' engagement in deliberate practice; evaluation of club learning environment) and a distinctive report may be desirable. In these latter cases, the audience for the report, the format the report will be delivered in (e.g., written summary, presentation, workshop), the specific content covered, and how often reports should be provided (e.g., a single report for a short project; quarterly reports for a year-long project) will all depend upon the nature of the consultation with the Skill Acquisition Specialist. As such, we suggest the following general recommendations in relation to monitoring and reporting:

- At the outset of any project, all details relating to on-going monitoring and reporting of the work should be agreed.
- On request, the Skill Acquisition Specialist should be able to provide examples of research papers which support the proposed intervention.
- Although there is often an eagerness to start an intervention as soon as possible, both the player/coach and the scientist must be patient until a comprehensive initial evaluation has been completed. Before starting any intervention, it is important to collect enough data to establish the current situation.
- The goal of a Skill Acquisition intervention with a player is to enhance their performance within the game situation. As such, analysis of performances in games should be used as part of the evaluation of interventions whenever this is possible.
- The effects of quality interventions should last beyond the time when a Skill Acquisition Specialist is working with players and coaches. As such, when judging whether an intervention has worked, a Skill Acquisition Specialist should include a follow up assessment several weeks after their final session working with the players or coaches. The precise number of weeks depends upon the nature of the intervention but revisiting the players/coach to check on whether the benefits have been retained is an important element of quality Skill Acquisition interventions.

5. HOW DO APPLIED SCIENTISTS FROM OTHER DOMAINS APPLY SKILL ACQUISITION?

Up to this point, examples of collaboration have focused on the Skill Acquisition Specialist and coach partnership. However, in many instances a Skill Acquisition Specialist will cooperate with performance scientists from other disciplines. Such disciplines might include performance analysis, physiotherapy, psychology, and athletic development. In this section, some of these broader partnerships are illustrated.

5.1 THE IMPORTANCE OF MULTIPLE SPORT SCIENCE DISCIPLINES WORKING TOGETHER

Healthy and holistic player development can be optimised through an interdisciplinary support team environment, where coaches and various sports science practitioners work together to support and develop players[35]. The following examples are not meant to be exhaustive, but rather to illustrate the different ways in which the Skill Acquisition Specialist can complement and extend the work undertaken by other performance scientists.

5.1.1 SKILL ACQUISITION AND SPORT PSYCHOLOGY

- **Shared mental skills:** Skill Acquisition Specialists and Sport Psychologists will often help players to develop many of the same mental skills (e.g., self-talk, imagery, self-regulation). Where Sport Psychologists typically focus on using those skills to enhance performance through boosting athlete confidence or motivation, Skill Acquisition Specialists apply those same skills to enhance the quality of practice sessions and accelerate learning. For example, mental imagery can be used to enhance the effectiveness of video review to improve a player's scanning and situational awareness[36]. Where both a Sport Psychologist and Skill Acquisition Specialist are engaged by a coach, player, squad or club, the two practitioners can work efficiently by coordinating their development of core mental skills.
- **Performance under pressure**: Skill Acquisition Specialists and Sport Psychologists are both concerned with a player's capacity to deliver under pressure and both Skill Acquisition Specialists and Sport Psychologists may work to simulate performance pressure within the context of practice sessions. Where Sport Psychologists often focus on specific mental techniques that a player can employ, Skill Acquisition Specialists are more concerned with ensuring practice sessions are designed in a way that will have pressure arise in the practice setting, so experience is gained in dealing with that situation as it would occur in competition. To that end, the Skill Acquisition Specialist can advise on how a coaches' instruction and activity design promotes more robust performance under pressure[37]. Coordinating both mental strategies for performance and effective practice design offers players the most robust preparation for competition scenarios.

5.1.2 SKILL ACQUISITION AND ATHLETIC DEVELOPMENT

- **Use of Cues and Analogies**: One of the topics from Skill Acquisition that has been most readily adopted by Athletic Development coaches is focus of attention. When performing conditioning or sport specific exercises, a player's attention can be drawn to a range of internal (how the body is moving) or external (the effect of the body's

movement) cues. Likewise, analogies – metaphors that capture the key elements of a movement – have been shown to have multiple benefits as a form instruction. The Skill Acquisition Specialist can coordinate their work with the Athletic Development coach to educate players and coaches as to the most appropriate cues and analogies to apply in different circumstances.

- **Balancing Load and Learning:** From an athletic development perspective, many sessions need to be delivered at high intensity. However, learning often requires reflection - a pause that is not conducive to maintaining high levels of physical exertion. Design discussions between the coach, Athletic Development Coach and Skill Acquisition Specialist can facilitate the development of training sessions that balance training intensity and opportunities to learn[12].

5.1.3 SKILL ACQUISITION AND PERFORMANCE ANALYSIS

- **Feedback delivery:** Facilitating the coach-led delivery of appropriate feedback to participants in multiple formats is one of the core competencies of performance analysts. The Skill Acquisition Specialist can work with Performance Analysts to ensure that players gain the most benefit from the way in which feedback is provided, as well as working with players to enhance their capacity to take feedback on board[38] and have it impact on the quality of future practice.
- **Enhancing decision-making:** One of the main roles of a Performance Analyst involves preparing scenario-based videos for short-term tactical planning. However, there is also the potential for scenario-based videos to be used in the long-term development of players. A Skill Acquisition Specialist may work with the Performance Analyst to develop a video-based training intervention to accelerate player decision-making[12].

"CLINICAL REASONING IS A KEY COMPONENT OF SPORTS PHYSIOTHERAPY, NONE MORE SO THAN WHEN DEALING WITH THE MANAGEMENT OF RECURRING OR CHRONIC INJURY. THE AWARENESS OF INJURY MECHANISM CAN REMAIN UNCONSCIOUS TO THOSE STRUGGLING WITH INJURY AND PLAYERS OFTEN ASK WHEN CAN I PLAY? AS OPPOSED TO, WHAT DO I NEED TO DO TO PLAY? THE JOURNEY TO RTP INVOLVES UNDERSTANDING INJURY MECHANISMS AND EMPOWERING THE ATHLETE WITH THE SKILLS AND HABITS TO OVERCOME THEIR INJURY CHALLENGE. MY UNDERSTANDING OF SKILL ACQUISITION HAS HELPED ME AS A PRACTITIONER GUIDE THE ATHLETE THROUGH THEIR RTP JOURNEY TO BECOME UNCONSCIOUSLY COMPETENT AND ALLOW, NOT ONLY A RETURN TO PLAY, BUT TO PERFORM."

(Liam Moffatt, Former Lead Physiotherapist with Mayo Senior Football)

5.1.4 SKILL ACQUISITION AND PHYSIOTHERAPY

- **Optimising progressions for safe return to play:** When an injured athlete is undergoing rehabilitation, great care is taken to ensure that the physical load the player experiences is gradually progressed. However, particularly in relation to high performance sport, efforts must also be made to ensure that the player returns with their skill levels as close to "match pace" as possible. The design of optimal late-stage return to play activities will draw upon the expertise of the coach, Skill Acquisition Specialist, Physiotherapist and Athletic Development coach to ensure that the player is spending time on activities that are safely within physical loading guidelines, but that these activities also maximise transfer to the competition setting.
- **Use of Cues and Analogies:** As with Athletic Development, one of the topics from Skill Acquisition that has translated into practice within Physiotherapy and Rehabilitation is focus of attention. When performing rehabilitation exercises, a player's attention can be drawn to a range of internal (how the body is moving) or external (the effect of the body's movement) cues. The Skill Acquisition Specialist can coordinate their work with the Physiotherapist to ensure players are using the most appropriate cues.

5.1.5 SKILL ACQUISITION AND BIOMECHANICS

- **Skill development:** One of the primary goals for a coach is to understand how a player moves, how they could move better in a manner that maximises their performance, whilst also minimising the risk of injury. The science of analysing sport technique is biomechanics. For players to optimise their skill development, the combination of biomechanical analysis with skill acquisition principles allows for the creation of drills that target specific weaknesses. For example, a Biomechanist may analyse a player's kicking technique and identify movement inefficiencies, which can be addressed through targeted practice activities designed by the Skill Acquisition Specialist. This integrated approach opens a gateway to optimise training programs which can be individualised relative to the player's needs in order to maximise their performance.
- **Minimise the risk of injury:** A key priority for coaches and players is to maximise their participation within Gaelic Games. This can be achieved by avoiding injury and ensuring healthy movement patterns through the guidance of a Biomechanicst and Skill Acquisition Specialist. For example, on retrieving a high ball, the Biomechanist may identify that the player's landing technique is predisposing them to an injury. Similarly, when a player changes direction quickly to evade the opposition, their technique may be placing excess load on certain joints and thus increasing the risk of injury. The Biomechanist can identify such risks and highlight the movement-related problems, but the expertise of the Skill Acquisition Specialist is needed to correct and retrain dysfunctional movement patterns through the appropriate implementation of practice activities.

6. WHERE CAN YOU LEARN MORE ABOUT SKILL ACQUISITION?

The Gaelic Games Coach Pathway aims to provide all coaches with the knowledge, skill, and capacities to develop players within and across phases of the Gaelic Games Player Pathway – "just for me" and "just in time."

Coaches have the opportunity to learn more about Skill Acquisition in a variety of ways. As detailed in the Gaelic Games Coach Learning Space, coaches can: attend coaching courses or specific workshops which include aspects of Skill Acquisition; have coaching chats, community of practice discussions or conversations with a mentor on aspects of Skill Acquisition; or engage with books, articles or podcasts which suggest ideas a coach can experiment with in their active coaching.
If you are eager to learn more about Skill Acquisition, below are a number of key recommended resources.

6.1 BE READY TO PLAY WEBINAR

The Skill Acquisition Working Group prepared a webinar as part of the Be Ready to Play series, entitled: Applying Skill Acquisition: Practical Tips for Coaches working with Children and Adults Across the Player Pathway. Recognising that for most players, it is the coach who applies lessons learned from research on Skill Acquisition, this webinar explains what Skill Acquisition is, why it is important for coaches to know about it, and provides some guiding principles for coaches to effectively employ Skill Acquisition.

6.2 THE PATHWAY CARDS FROM THE GAELIC GAMES PLAYER PATHWAY & SPORTS SCIENCE 2030 VISION

Examples of how Skill Acquisition can inform all players on the Gaelic Games Player Pathway are detailed in the Pathway Cards which accompany the Gaelic Games Player Pathway & Sports Science 2030 Vision. Examples of how Skill Acquisition can inform all players on the Gaelic Games Player Pathway are detailed in the Pathway Cards which accompany Gaelic Games Player Pathway & Sports Science 2030 Vision.

GAELIC GAMES PLAYER PATHWAY

	F1		
	WHAT?	WHO?	HOW?
SKILL ACQUISITION	• Broad development of FMS* and FGS* to facilitate future engagement in sports and love of participation.	• Coaches, parents/guardians, teachers.	• Coach Development, Coach Developer Support, Parent/Guardian Education.

*FMS = Fundamental Movement Skills
*FGS = Fundamental Game Skills

GAELIC GAMES PLAYER PATHWAY

	T2		
	WHAT?	WHO?	HOW?
SKILL ACQUISITION	• For players, development of effective practice techniques in the context of individual and group training. • For coaches, individual review of design (e.g. selection and sequencing of practice activities), delivery (e.g. instruction and feedback), and evaluation (e.g. testing procedures) covering generic topics.	• Coaches support players. • Skill Acquisition Specialist, Coach Developer, or Mentor Coach supports coaches.	• Coach Development, Coach Developer Support. • Additional online/face to face resources and education. • Player Mentor Training.

GAELIC GAMES PLAYER PATHWAY

	F3 / ADULT		
	WHAT?	WHO?	HOW?
SKILL ACQUISITION	• Develop awareness of the complementarity of play and practice, and of Gaelic Games and other sport participation, for skill development. • For players, development of effective practice techniques in the context of individual and group training. • For coaches, individual review of design (e.g. selection and sequencing of practice activities), delivery (e.g. instruction and feedback), and evaluation (e.g. testing procedures) covering generic topics.	• Coach/In Club Expertise through coach-practitioner meetings.	• Coach Development.

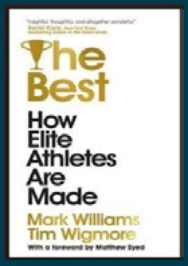
Figure 12. Excerpt from the Be Ready to Play webinar: Applying Skill Acquisition.

6.3 NETWORKS AND EVENTS

There are a number of professional networks dedicated to promoting the discipline of Skill Acquisition. These networks include Movement & Skill Acquisition Ireland and the UK-based Expertise and Skill Acquisition Network. Visit the websites of these organizations to learn more about the events and resources that they host.

6.4 ADDITIONAL RECOMMENDED RESOURCES

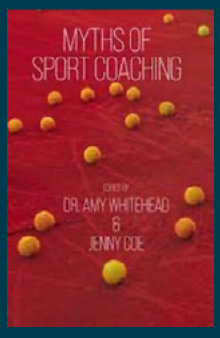
The below resources are a useful introduction to the wider range of topics covered under the remit of Skill Acquisition.



Professor Mark Williams and Tim Wigmore draw upon the personal stories of a range of athletes to illustrate the processes underpinning the development of sporting expertise. In doing so, they cover a wide range of Skill Acquisition topics applicable to coaches working with athletes from grassroots to high performance.

The Perception and Action Podcast is hosted by Professor Rob Gray of Arizona State University. It explores how psychological research can be applied to improving performance, accelerating Skill Acquisition and designing new technologies in sports and other high-performance domains. You can listen to the podcast at: https://perceptionaction.com/

The Sport Psych Show is hosted by Psychologist Dan Abrahams. Although it has a broad Sport Psychology focus, it contains many interviews with elite competitors, sports coaches, sport scientists and psychologists exploring what great practice looks like, how players can progress more quickly, and how does learning in sport really happen? You can listen to the podcast at: https://thesportpsychshow.libsyn.com/



Written by leading international researchers and practitioners, Myths of Sport Coaching offers invaluable theoretical and practical guidance for coaches. Debunking some common myths and misconceptions in an engaging and informative way, this book supports an evidence-based practice approach and will support you to reflect critically on the way you operate within your sport. In addition, several chapters within this book focus on Skill Acquisition topics such as deliberate practice. Children love to move.

MoveWell is a guide to exploiting children's playful and creative nature by creating environments that allow them to explore and develop their movement potential. By building their movement abilities, competence and confidence to play games with others, children are better prepared for lifelong physical activity.

boing

Boing is a set of principles and resources that allow all children to develop their physical literacy through active and inclusive play.

There are a wide range of academic textbooks on various aspects of skill acquisition. A good starting point for anyone looking for a more formal introduction to the discipline is Developing Sport Expertise from Damian Farrow, Joseph Baker and Clare MacMahon which covers a wide range of topics from children's introduction to sport to high performance. Each chapter features a "coach's corner" where leading coaches offer their insights on the topics discussed.

CONTRIBUTORS

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