Curling coaches' understanding of their role in developing performance under pressure through skill acquisition

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Abstract

There are few studies examining coaches' awareness of their role in developing performance under pressure. This study has explored the application of implicit and explicit learning theory for skill execution under pressure through the understanding of coaches. Seven curling coaches who teach adult novices were interviewed using a semi-structured approach. Interpretative phenomenological analysis was used to explore their experiences and beliefs around skill acquisition and pressure. Key factors that emerged from the analysis were the coaches' lack of awareness of their role in developing skill execution under pressure and the importance of coach education in creating that awareness. The recognition of the pressure that players will face in games and the potential for implicit techniques to be employed by the coaches demonstrated positive prospects for the application of implicit/explicit skill acquisition theory. The coaches' experiences highlighted aspects unique to curling that will need to be considered in progressing the study's findings. The distinction between skill set-up and execution was also raised by coaches and requires further study to identify if it impacts the effectiveness of building robust skills and the resulting coaching advice. The study provides recommendations for application of the theory and suggestions for future research.

Keywords: skill acquisition; pressure; IPA; curling; sport; coaching

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Introduction

Considerable efforts have been invested to identify the 'best' way to coach new skills and attempt to understand the mechanisms behind motor learning. Current approaches and theory are built upon decades of work and prior research suggests that the mechanisms are open to influence from the environment and skill performance context (Masters & Maxwell, 2004; Verburgh et al., 2016).

One aspect that appears to have a complex relationship with skill performance is the application of implicit and explicit learning. Traditional learning techniques encourage explicit learning, whereby the learner is taught the rules and specifics of technique that lead to successful completion of the skill. It is also possible to gain skill knowledge though through implicit learning (Berry & Broadbent, 1984; Reber, 1967), whereby the ability to perform the skill is developed without gathering explicit rules knowledge. These early studies demonstrated that participants could control complex systems without an explicit awareness of the rules required, instead being guided towards task success by practice and observation. Gentile (1998) suggested that without some implicit process, explicit learning is not enough for successful performance. However, explicit learning groups have repeatedly been shown to perform better earlier in practice (e.g., Hardy et al., 1996; Maxwell et al., 2000), supporting the belief that explicit learning is a faster way to learn a motor skill.

Implicit learning is generally found to be a more stable form of gathering motor skills. While explicitly learnt skills can become automatic with time and practice (Fitts & Posner, 1967), they do not appear to be as robust under pressure (e.g., limited time to perform, increased value of the outcome, or an evaluation by others) as those learned implicitly (Hardy et al., 1996; Masters, 1992). It is of practical relevance in sports coaching that implicit learning appears to be more robust in these contexts (e.g., Law et al., 2003; Liao & Masters,

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2001; Maxwell et al., 2000) since sports performers are often asked to display their skill in pressured competition environments. Breakdown of expert skills under pressure can result in an otherwise highly competent performer failing at the crucial moment (e.g., missing a penalty in soccer, inability to catch the ball in rugby, or a gymnast falling from the bar). Therefore, the way a skill is taught initially may impact the ability of the athlete to perform later in their sporting career.

To explain the robustness of implicit learning, Reber (1992) proposed an evolutionary explanation for the distinction between the two learning systems with implicit processes having survived longer. An alternative explanation, although not mutually exclusive, focusses on the live cognitions involved. In stressful situations the automaticity of a learned task is disrupted by the involvement of working memory (Deikman, 1966; Wulf et al., 2001). Masters (1992) termed this 'reinvestment' and proposed that control of a motor skill is disrupted when working memory manipulates conscious, rule-based, explicit knowledge. Subsequent studies show that gathering more technical information in learning does indeed increase the likelihood of breakdown under pressure (Liao & Masters, 2002; Masters & Maxwell, 2004). Expert golfers also performed worse when they had longer to execute a putting skill, whereas the opposite was found for novices, suggesting that experts' performance is disrupted by having the time to cognitively reinvest (Beilock et al., 2004), but that novices benefit from time to access declarative knowledge. This finding would suggest that implicit is not necessarily the 'best' approach in all circumstances and a combination of implicit and explicit learning may be appropriate.

Reinvestment may not always lead to a negative outcome though. For example, Malhotra et al. (2015) proposed that explicitly altering already learned movements should take place away from pressure and a more implicit approach thereafter will still likely yield

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better outcomes under pressure conditions. Jackson et al. (2006) agree that there is a role for explicit awareness and suggest that monitoring movement and controlling movement are ends of a continuum; controlling movement being the disruptive element seen in reinvestment.

Learning approaches that have been tested to overcome the emphasis on explicit learning and limit the rules knowledge gathered include analogous (heuristic) learning, errorless learning, and reduced feedback. For example, Liao and Masters (2002) successfully used heuristics to teach novices a table tennis skill. Koedijker et al. (2011) compared experts and novices given explicit and analogy instructions under different speeds of performance. Their findings supported the use of analogy as a method for implicit learning and indicated that implicit coaching can allow learners to bypass the declarative stage, but that it does not replace the need for practice to reach an autonomous level. Errorless learning has also been effective when combined with later instructional rules in the learner's practice (Poolton et al., 2005). These studies suggest that implicit learning processes need not operate in isolation and that explicit coaching may have its place in what is a complex learning pathway. More applied research is needed to find effective ways to integrate implicit learning into coaching and help sports practitioners to understand when to use each form of learning.

The research to this point in implicit/explicit learning has been limited in scope. The majority of studies have examined motor skills in simple, closed tasks (e.g., golf putting) within experimental conditions. Few studies have considered how this learning can be transferred into coaching practice. The only exceptions found by the authors are Gabbett and Masters (2011) and Poolton and Zachry (2007). Gabbett and Masters explored the challenges faced in high-performance environments, with the pressure for short-term gains making it difficult to incorporate new coaching techniques that may not demonstrate immediate results. Poolton and Zachry offer practical guidance to incorporate errorless and analogous learning

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(as well as external focus) into coaching. Whilst these two papers are potentially helpful, more studies are needed to provide coach developers with the confidence to incorporate implicit approaches into coach education.

Sport-specific research would also encourage transfer of the theory into practice. Two studies have looked to do this in football (Gredin & Williams, 2016; Verburgh et al., 2016). Gredin and Williams recognised that current football coach education emphasises explicit rules and neglects the potential individual differences in optimal movement patterns. Their findings support the benefits of implicit learning in the longer term and in novel conditions, but the study only looked at a simple skill in isolation. Application in wider real sport-specific settings is needed to encourage integration of theory into coach development.

Implicit learning may complement the recent shift towards constraints-led coaching (e.g. Pill, 2014) and dynamical systems theory (Davids et al., 2008). Alternatively, explicit learning is more likely represented in technique focussed skill learning whereby skills are broken down and repetition is used to create movement patterns. A key similarity between constraints-led learning and implicit learning is that the focus is not on one ideal motor movement. Both allow the individual to learn to complete a skill in a way that suits their own experience, strengths, and body limitations.

As with implicit, constraints-led learning aims to develop more robust skills that are more responsive to constantly changing environments and performance pressure (Light, 2008). This approach has been used with both dynamic (e.g., Otte et al., 2020) and closed skill sports (e.g., Verhoeff et al., 2018) and has been found to result in skill performance improvements. An understanding amongst coaches of implicit learning principles could therefore complement the movement towards constraints-led coaching and provide more scope for improved skill robustness.

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The current study explores the role of coaches in integrating such new techniques. Liao and Masters (2001) state that "one would expect sport coaches … to look favourably on teaching methods that bring about longer-lasting skill and robust responses under time pressure" (p. 308). However, this assumption does not consider how the understanding that coaches have of their own role could impact on their openness to new methods. Coaches operate in different settings, bring different experiences to bear and have different pressures on their own coaching.

This study will explore curling coaches' perception of their experiences, whilst looking to understand the viability of moving skill acquisition theory into coaching practice. Specifically, the study aims to ascertain the understanding that curling coaches have of their role in developing robust skills for execution under pressure through different learning techniques. Further, this study aims to offer guidance on how different learning techniques could fit within curling coaching and coach education programmes. Curling was selected for this study context as it provides a fairly unique environment for adult motor skill acquisition since the movements involved are exclusive to the sport, as opposed to fundamental skills that transfer across other sports (e.g., running, jumping). Further, the nature of the game means that each shot is played in isolation and so comes with pressure for each performer when they become the sole focus for the game. The study was undertaken in Scotland where the curling culture is focused on competitive games, with limited practice and coaching opportunities available to club players. Unlike most other sports, curling clubs do not operate regular training sessions due to limited access to ice facilities and a traditional club culture. An exception to this is the 'Virtual Clubs', which exist to introduce adults to curling. New curlers in a Virtual Club receive regular coaching sessions. These curlers may be a member of another club simultaneously and so are often playing competitively as well as receiving coaching for the first two years of their curling career. Thereafter they move into only playing

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for a regular club (or clubs). It is anticipated that the culture of curling will impact the views

of the coaches involved in this study and that their experiences may differ from those of more

coaching-orientated sports.

The study contributes to the breadth of research on skill acquisition by taking well-

grounded theory and moving it into an applied setting. This is something that is currently

lacking in implicit/explicit coaching studies and is necessary if coach education is to be

influenced and improved by psychological theory.

Method

To explore the participants' understanding of their role in developing robust skills

under pressure in their players, this study adopted an Interpretative Phenomenological

Analysis (IPA). IPA is an appropriate approach for this research since it focusses on the

participants' lived experiences and the sense that they have made of those experiences

(Smith, 2011).

IPA differs from other qualitative methods in several ways. Firstly, it values how the

participants' individual perceptions, assumptions, and memories come together to create a

meaningful experience (Husserl, 1970). The phenomenological aspect of it does not deny an

external reality (as with a radical realist ontology) but highlights instead the importance of

meaning and experience in creating our truth. This truth also has temporality within

experience. Secondly, IPA therefore draws themes from individual contributions, but

continues to hold the individual experience within those themes (Eatough & Smith, 2008).

IPA is also a hermeneutic approach (Smith, 2010) in that it recognises that both the

participant and the researcher are drawing interpretations from the experiences. This is the

concept of double hermeneutics; whereby subjective interpretation takes place at the level of

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the participant and again at the research level. This recognition allows researchers to be open about the fact that an understanding of experiences cannot be simply downloaded from a participant's brain and it is inevitable that some subjective interpretation will take place (Willig, 2008). IPA also recognises the intersubjectivity of experience and that the meaning given to experiences in essence becomes the experience itself for the individual (Brown et al., 2018).

To be able to progress the application of theory to coaching practice, it is important that consideration is given to the current experiences and perspectives of those coaches who will ultimately implement the practice. IPA allows this deeper analysis of individual understanding and awareness because of its phenomenological focus, valuing each contributed experience equally and recognising that they will differ. No two coaches will approach their coaching having had identical learning experiences to that point so it is important to be able to acknowledge that in how research analyses their contributions. Therefore, IPA was selected as the most appropriate method for gaining an understanding of the coaches' awareness and understanding in this study.

This study adopted semi-structured interviews, including vignettes. In line with IPA guidelines (Smith, 2011), the interview questions were designed to illicit information on what participants experienced and how this influenced other experiences in their coaching. The questions were used as a guide only to stimulate discussion and not as a rigid requirement. The participants' experiences were allowed to drive the interview content. Semi-structured interviews were therefore used to allow comparison between experiences and flexibility to explore individuals' unique understanding of their coaching role. The interview guide covered an introduction to the participant's coaching (e.g., What brought you to coaching?), exploring participants' awareness of the impact of their coaching (e.g., Do you notice a

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difference in performance when coaches are closely watching the players?), and participants'

awareness and use of implicit and explicit learning styles (e.g., What would you ask a player

to think about when playing a shot?). The two vignettes (Supplementary Materials 1) were

presented at the end of the interviews to gain an insight into the coaches' approaches to real-

life coaching scenarios, one with a beginner and one with a more experienced learner.

The vignettes were included to allow the participants to contemplate the ideas

discussed through the interview in a familiar scenario. Vignettes are not proposed to predict

behaviour, but instead allow interviewers to explore participants' knowledge and also draw

interpretative conclusions from their process of interaction with the vignette itself (Jenkins et

al., 2010). This use of vignettes therefore aimed to enhance the understanding of the

participants' subjective experiences in the current study.

Participants

Since IPA aims to gain an insight into the experiences of individuals, smaller samples

of participants is justified (Smith, Flowers, & Larkin, 2009). Purposeful sampling was used to

identify seven curling coaches working in the Virtual Club structure (regular adult beginner

coaching sessions). A UKCC Level 1 qualification and at least 12 months of coaching were

considered sufficient for them to be able to reflect upon their practice. In the current sample,

all were UKCC Level 1 or Level 2 qualified curling coaches.[1] The participants were seven

coaches (five male, two female) aged 51 to 68.

Following ethical approval from the University Ethics Committee, coaches were

approached directly by the first author and via an email from Scottish Curling's Workforce

Development Manager. The first seven who responded with interest and met the study criteria

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[1] UKCC is the United Kingdom Coaching Certificate and is a recognised qualification endorsement scheme provided by Sports Coach UK to multiple governing bodies of sport.

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were invited to take part in the study. The coaches had between 2 and 17 years' experience of

curling coaching (as qualified coaches).

Procedure

Each coach was provided with an information sheet and gave informed consent before

completing an online demographics questionnaire and participating in the semi-structured

interview. The interviews were conducted by the first author. The interview guide was piloted

with two coaches not involved in the study to check for flow and provision of adequate depth

on the research questions. Interviews were recorded on digital audio and lasted between 45

and 60 minutes.

A debrief was provided to all participants to explain the study and answer any

questions raised by it. The interviews were transcribed verbatim by the first author and the

data then subjected to analysis.

Data Analysis

The IPA was carried out by the first author and supported through the use of NVivo

(version 11) software. IPA involves each case being examined in depth and independently to

capture the essence of each experience. Prior to this process, the first author engaged in

bracketing to identify her own preconceptions of the topic (Tamminen et al., 2013). These

flowed from her own experiences as a player within a Virtual Club. This was an important

process to ensure that the experiences of the participants were fully reflected in the analysis

and not coloured by the first author's own experiences. Whilst it is likely impossible to

entirely bracket one's own biases, an awareness of them and careful reflection of analyses

reduces their influence on the research (Sanders & Winter, 2016).

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Following the structure recommended by Smith (2011) for IPA, each transcript was repeatedly read to gain familiarity with the whole account and notes made of interesting or significant data. Attention was paid to both the meaning of what was said, and the language used. Initial coding was then carried out to identify pertinent themes in the transcript, capture essential meaning, and start to create concise and academically relevant phrases for each. The emergent themes were then analysed to identify clusters of shared meaning and sub-themes and create a table of all emerging themes. At this stage, the themes were re-checked against the transcript to ensure they were consistent with the participant's original responses and to ward against researcher bias from the first author's own experiences in curling.

This process was repeated with each transcript individually, allowing new themes to emerge. A cross-case analysis was then carried out to identify similarities, differences, and patterns across the themes. At this stage, higher order themes were selected as most relevant due to the depth of data from participant experiences and their relevance to the study aims. Presenting a limited number of themes has been previously demonstrated as a practical approach to deeper analysis (Warriner & Lavallee, 2008).

Throughout the data analysis and interpretation of results, the research adopted a social constructionism approach, such that knowledge is gained through social context and reality is influenced by shared assumptions. This approach allows for the unique experiences and of the participants to be valued, but also acknowledges that meaning from these are jointly constructed within a social environment.

Establishing Rigour

IPA has an inevitable level of subjectivity (Willig, 2008) therefore following the IPA process in depth with each participant data was vital for transparency, with a constant awareness on what the participants actually presented to avoid substantial interpretation from

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the first author's standpoint (Biggerstaff & Thompson, 2008). With IPA though there is no potential to reveal an objective reality (Brocki & Wearden, 2006) and so it is more important to recognise where influences on the interpretation of reality may come from, beyond the participants. In this case, the first author had personal experience of the Virtual Club environment and had been coached through it. This brought with it an interpretation of the experience of being an adult learner and what pressure meant to her as a novice curler. Holding this in awareness and reflexivity throughout the analysis was vital to ensure that the results reflected the subjective reality of the participants and not the first author.

Through a relativist approach rather than universal criteria (Smith & McGannon, 2018), several strategies were used to improve rigour in the research, including member checking, critical friend, thick description, and reflexivity. Member checking was informal, with participants sent the results and asked to respond with any concerns or inaccuracies that they perceived. The responses from participants were supportive of the results. However, due to the limitations of member checking for credibility (Smith & McGannon, 2018) the second author took the role of 'critical friend'. The second author was not involved in the original data gathering or analysis and so was able to provide an impartial view of the data in this role. This allowed alternative interpretations of the data to be explored, which were then discussed with the first author to reach consensus on integration of these into the final presentation of results. This was particularly relevant as the first author brought their own experiences as a curler to the study process, whereas the second author had no in-depth knowledge of the sport. This enabled researcher triangulation to ensure quality of the data by helping to uncover any biases in the lead authors' data analysis. Finally, the results are presented with substantial quotes and thick descriptions of coaching experiences from the data (as per Smith, 2011, recommendations) to allow the reader to determine for themselves

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whether the conclusions are supported by the study data and to keep the participants' voices at the heart of the study.

Results

Analysis of the interview transcripts revealed 65 subordinate themes that were clustered into eight higher order themes; awareness of player differences, entity and incremental thinking, influence on coaching approach, limiting factors, role of coach, self-awareness, types of pressure, and use of coaching feedback. The four key themes presented in the results were selected as most relevant to the study aims and those providing the deepest data. These themes are; implicit and explicit coaching awareness, role of coach, influence on coaching approach, and types of pressure. Implicit and explicit coaching awareness is a sub-theme of use of coaching feedback but held the most insightful data for practical application of skill acquisition theory. The findings from each of the four themes are presented below, along with in vivo participant quotes that capture the essence of the theme.

Implicit & Explicit Coaching Awareness – "don't think about it"

The participants were able to discuss implicit and explicit techniques. All the coaches spoke about breaking down the skill of sliding and delivering a stone into its stages when working with adult beginners. Coach 2 said:

As part of your coaching you're teaching them the process of the delivery. So the standing behind the hack, stepping into the hack, the ready down, they're doing their set-up, their pull back, and all the different stages. So that is kind of laboured into them as part of the process. So when they're coming to play the shot they should be going through that in their head 'right ok, so that's the ice, I'm looking at the ice, I'm now stepping into the hack with my foot pointing at the skip, I've got the handle, you

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> know so it's all, and then once they've released it they've gone through the checklist. So I would expect them to be going through a checklist as they're delivering the stone. Not thinking about their dinner!

Coach 3 stated:

> I tell them to try and break it down. Basically face the brush, because that's your target, it's not where the stone finishes, you're aiming at the brush at the far end. So make sure you're square to that, get down and get into the ready position and then forget about it. You can't do anything else, you're setup that's it. So then concentrate on where you want the stone to be delivered to and what handle, you know. And as you're sliding out have the stone in the right position and let the stone go. You can't do any more than that. So the way to try and break it down into stages and not clutter their brain up with too much information when you're trying to slide out. Break it down into sections and then blank your brain and go to the next stage.

Coach 1 also stated that he would "break that down into individual components and more often than not we will be going through every single component". Coach 3, Coach 4, Coach 6, and Coach 7 spoke about a distinction though between set-up for playing a shot and delivering the stone.

> The optimal situation is that when you get into the hack, your mind is visualising the delivery and where that stone is going…when you get down there, you're not thinking too much about the stages of the 1,2,3, ready, steady, go. Your focus is on the brush. (Coach 7)

Coach 3 commented:

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I try to keep it as simple as possible, you know. Don't complicate things. Once you've done your setup, there's nothing more you can do about it so just concentrate on 'right what weight does he want me to put so how much have I got to push with the right leg'. And then you can forget about that because you've got it mindset logged up here as to how hard you're going to push out, so then you're concentrating on sliding towards the brush and putting the right handle on it. Yeah so break it down and not clutter with information.

Coach 2 and Coach 4 indicated that they were aware of previous experience that players brought with them, in particular their previous sporting experience. Coach 4 commented, "People who have done sport in the past and are used to being coached, yeah they want to know the nitty gritty" and "I probably use more imagery with non-sporty people because they don't necessarily know how to make their body do things by just telling them to do things." Coach 2 stated "…from individual sports backgrounds…I think are constantly analysing what they've done and they don't see the bigger picture sometimes."

When asked about techniques that they currently use, five of the coaches were able to give examples of implicit techniques; including analogies, dual task distraction, and no-feedback learning. Coach 1 offered, "An analogy I use is superwoman or superman. I want everything dead straight". Coach 2 and Coach 4 both talked about being less likely to use these techniques with adult beginners than with children. Coach 4 and Coach 7 use them with more advanced beginners who already know the explicit elements of the technique. In justifying her approach, Coach 4 stated "to deliver a stone well at the stage that they are at, they have to be thinking a lot about what their body's doing". Coach 4 and Coach 7 both talked about the "feel" of throwing a stone and using it in their feedback. Coach 7 saw it as an aspiration to "get somebody to the point where they've almost forgotten about the technique

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and it's all about the touch and feel". Coach 4 uses words like "whoosh" and "smooth" to "get them feeling it" and acquire a good technique.

Coach 2, Coach 4, and Coach 5 gave explanations for using implicit coaching, but they differed in the reasons given, showing individual rationales drawn from their own experiences. Coach 2 talked about using dual tasking to avoid people getting "stuck":

> …trying to think where we could use that has given me some ideas. Because people can get so hung up at a certain thing and just sometimes you say to people 'just throw the stone, don't think about it, just get up there' because they get stuck. It's like I used to play golf and you would constantly be standing with the ball but 'I'm not quite right, where's my foot, my balance'. You're thinking of so many things that it's almost just like clear the memory banks and play the stone and then come back.

Meanwhile, Coach 4 and Coach 5 both talked about blindfold curling to focus the mind on what the body is doing. Coach 5 commented:

> I would understand that if you're blindfolded it takes away the sort of, you're not seeing anybody at the side, you can concentrate, focus on doing it without any sort of distractions. Get into your mind, a mental thing that you're going to slide out of that hack and you can concentrate more inside.

Role of Coach – "you're a bit of everything"

How the participants see their own role was a theme with some similarities in views. Creating club players was a significant area of attention for all the participants, with enjoyment and confidence seen as crucial aspects to achieve this. Coach 1 stated, "make sure they're enjoying their curling because if they don't do that there's a good chance they won't progress into the club situation". Coach 7 said his role was "to make sure they are

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comfortable and confident to be part of a rink and play a competitive game of curling" and Coach 5 said, "we're training them up so that they can go and join a club and curl proficiently within the club environment". Coach 2 built this preparation for independence into her coaching, perhaps recognising that coaches will rarely be at games:

> There are ones who are more needy and are constantly 'oh, could you just come, just come and help?', but on the whole we do step back so we kind of force them to have to make decisions for themselves and not be relying on coaches. Yes certainly the personalities do change and there are some who are not comfortable initially with that - 'oh I need somebody to tell me', constant reassurance. But then the team role comes into play as well so the idea is that they are helping each other out, which we do try to encourage through coaching as well.

Coach 4 felt that team dynamics were a significant part of her role, building a positive experience from both an individual and team perspective, "I mean the virtual club do play competitions so it's teaching them about teamwork. To me it's not just throwing stones together, it's about how to play as a team." Coach 2, Coach 3, Coach 5 and Coach 7 also talked about the team aspect of the game and their role in helping people to understand the different roles in a team. They focussed more on understanding the game than the team dynamics, "that they know the etiquette and they know the job that they're supposed to do" (Coach 7). Coach 3 sees progression to skip as an aspiration for his players, "you'd like to see them progress through the ranks and ultimately become a skip" and Coach 2 recognised teambuilding as part of her role "team role comes into play as well so the idea is that they are helping each other out, which we do try to encourage".

Five of the participants brought up the need to encourage practice to develop skills to be resilient in games, but their reasoning for how it applied differed. Coach 2 and Coach 4

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referred to creating "muscle memory" through practice of technique. Coach 4 specified how she saw her role within this: "As a coach you set them up to make sure they're practicing the right thing." Coach 7 did not use the same 'muscle memory' language, but talked of the fragility of technique:

> If your technique is more fragile and you've been working in a coaching situation then it's more likely to go down in a game situation when you're being asked to deliver a stone to a certain place in a certain way. Then you can't rely on your technique perhaps as much. So, I think a lot of it is down to practice.

Coach 1 talked of practice as a route to confidence and embedding new techniques and Coach 3 also saw practice as a route to "bolstering their confidence" and said, "Your game will completely collapse if you try and do what you've just learnt without practice in the middle of it. They go back to their old ways, which they're more confident about."

Influences on Coaching Approach – "you need to be mindful"

All the participants included references in their answers to beliefs or previous experiences that influence the way they approach their coaching. Coach 1, Coach 2, Coach 3, Coach 5 and Coach 7 all discussed their own experiences of being coached and in all, except for Coach 2 and Coach 5, this was very limited. To the extent that Coach 1 took up coaching as a route to improve his playing, "If I take a coaches' course, by doing so I am going to improve myself". Although Coach 5 had received a lot of coaching, having come through the Virtual Club himself, he didn't enjoy it all and it influenced his reasons for becoming a coach; to be a different type to the one he had been coached by. Coach 5 stated: "I did enjoy it to certain extent … that was partly the reason that I sort of wanted to go into it because I thought that some of the methods that he used … aren't that good."

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Coach 2 stated that her lessons experience differentiates her from the norm in curling:

> I attended lessons there and I think because I've come from a lessons background it
> meant that I'm happy to be coached and I attended refresher lessons… So I was
> always keen to improve my game, which is probably not typical of a curler. The club
> curlers that learnt 100 years ago and don't want to change anything. It's the strangest
> sport because we don't practice; you go on and you play a game. (Coach 2)

The participants' openness to their own learning came through in their answers.
Coach 2, Coach 4, and Coach 6 were the most positive and aware about their ability to learn
and potential to try new approaches. Coach 6 and Coach 4 were particularly intrigued by the
implicit approaches that were discussed and were keen to consider how they might be
applied. Coach 4 asked questions about errorless learning when it was introduced to the
conversation, even though she hadn't used it specifically:

> I quite like that idea. not quite sure how I could fit it in with the curling scenario, but
> yeah… Is it something that's used just as a small slot within a coaching, a bigger
> coaching session? Or is it a method that is used all the time?

Coach 6 integrated use of analogy into a subsequent scenario answer, even though it was new
to him, "Now that I've learned, analogy would be a good one."

Types of Pressure – "they feel pressure"

All the coaches acknowledged that there is pressure of some kind within curling.
Their understanding of the form it takes and when it might manifest differed though. Coach 1
and Coach 3 talked about the peer pressure of playing for and trying to fit into a club and that
avoiding 'being embarrassed' brought pressure for players. Coach 1 stated "peer pressure -
they don't want to embarrass themselves in front of the other team".

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Pressure to win games was brought up by all the participants. Although Coach 5 acknowledged that performance can drop in a game, "they maybe do crumble", he didn't believe that the pressure was significant:

There's no pressure in a club curling game really. It's not the end of the world. You could make it that way if you're in some sort of, sort of deciding game in the week or something like that but really, you're only there to enjoy yourself really at the end of the day to get you out the house.

He talked about players "getting hyped up" as surprising to him, "I've seen people on the hack actually talking to themselves, talking through the shot they're going to play, and a couple of them at the virtual club as well." Coach 1, Coach 4 and Coach 6 all identified game pressure resulting in players putting shot outcome ahead of technique. They felt this was not good for the players' longer-term development, but that the lack of practice opportunities in curling meant that it was inevitable. Coach 1 stated: "When he's being coached he's got a lovely slide out and delivery, but when you put him in a game scenario it collapses … he wants to improve, but he doesn't want to do it in a game situation."

When asked about why they thought that players' performances dropped in games, Coach 2, Coach 4, and Coach 7 believed it was a lack of focus on their technique and being distracted by the game itself, "a lot of technique goes out the window because they're concentrating on the end product of the game" (Coach 4). Coach 7 commented:

They come to play a club game and they're all over the place. Yet you know they've had all this coaching. In fact you may have been involved in the coaching with them and you've seen them deliver and play. And yet when it comes to the game situation then they're not delivering as they did in practice and that's just because there are other elements that come into it.

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Coach 2 stated that game pressure is inevitable and so it is the coaches' role to prepare them for it, "you can't take people out of the situation…they have to learn how to get on with it". Coach 6 is the only coach to have experienced players who perform poorer when being watched by a coach and talked about the mixed reactions of players. All the other coaches reflected that players tended to improve when the coach was obviously watching, "they know they can do it and think 'Coach 1's watching me, I'm going to try a bit harder'" (Coach 1). Coach 2, Coach 3, and Coach 6 made specific mentions of player cognitions and an awareness that some players will react differently to pressure. Coach 6 stated, "there are the odd one that just can't stand anybody watching them, but they want to do it and they get all nervous." Coach 2 said, "they need to understand themselves and how they react to that pressure and how they react to a team scenario as well."

Discussion

The current study aimed to investigate the understanding curling coaches have of their role in developing robust skills in adult beginners and explore the coaches' awareness of the potential impact on this of implicit and explicit coaching techniques. Whilst research has extensively examined the impact of using explicit-implicit coaching techniques (e.g., Gredin & Williams, 2016; Maxwell et al., 2000; Mullen et al., 2007), the awareness of the coach about the techniques has not been specifically explored. The findings from the four themes will be discussed here, along with their relevance for the application of theory to practice.

Throughout the theme of Implicit & Explicit Coaching Awareness, the participants' comments showed the potential for integrating implicit coaching into curling and highlighted the challenges involved. Explicit coaching was the more common approach cited to coaching the basics of the slide. Five of the coaches were able to give examples of using implicit techniques, but their comfort with using them differed. It appeared that some of the coaches

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were open to exploring implicit techniques and understanding how they might be incorporated into their coaching. Some of the coaches had a real aspiration to get their players to a stage that would respond to implicit coaching (e.g., talking of the 'feel' of playing), but their view was that they needed explicit coaching to develop that level initially. This view supports the findings of Beilock et al. (2004) that novices benefit from time to access declarative knowledge; explicit teaching may have its place within early learning in curling.

Another insight from the same theme was that four of the coaches recognised shot set up and delivery as two distinct elements of the overall skill. This raises the question of whether explicit coaching of set-up is appropriate to establish a routine and if so, at what point in the overall skill process does reinvestment become a possibility. If the set-up element is a form of pre-performance routine then golf research in this area may hold insights, due to the similarities of isolated skill execution in both sports. For example, McCann et al., (2001) found that teaching a pre-performance routine to both novice and experienced golfers improved skill performance. The methods of teaching the pre-performance routine included both explicit (e.g., waggle the club) and implicit instruction (e.g., perform the swing recalling the word "smooth" on the backswing and the word "swing" on the downswing). It would be of interest to further explore this and apply skill acquisition theory to pre-performance routines to examine if the style of learning affects the impact the routine has on performance. This may result in findings that create a distinction between recommended acquisition methods for pre-shot set-up and shot deliveries.

Some of the coaches who used implicit techniques mentioned that they were more comfortable using them with children than adults as adults expected to be told the explicit details of the skill. Several coaches did use analogies within adult contexts and so it may simply be that a lack of familiarisation with using them in that environment made it difficult

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for the others to see how they would suit. It is possible that some players bring expectations of a need for explicit details from other sports, but that would not rule out challenging those expectations. Callary et al. (2015) found that adults felt that they should be coached differently to children and have different expectations for instructional style. These preferences would need to be given due consideration in applying implicit learning approaches, but expectations for coaching approaches could still be explored to identify if they would be comfortable with a more implicit approach.

How the coaches view their own role will also impact this and was identified by the emergence of the Role of Coach theme. All the participants saw their role as creating club players, which is understandable given that the Virtual Clubs are designed as feeders into clubs. The participants' focus was on developing confidence and competency and while some of them were aware of player differences in reactions to pressure, there was no awareness of a link between the form of skill acquisition and later performance in the face of pressure. It is unsurprising that these elements are not linked by the coaches in this study, since current coach education does not make the connection (F. Harfield, Scottish Curling Workforce Development Manager, personal communication, 14 August 2018). If skill acquisition through implicit learning leads to more robust skills (Hardy et al., 1996; Masters, 1992) then those who are coaching at early skill acquisition stages need to be supported to be aware of the implications of their coaching technique choices.

Data within the Influences on Coaching Approach theme indicated that the lack of coaching opportunities for players and the emphasis on playing fixtures in club structures influenced the coaches' own experiences of their role. For example, they felt limited by the lack of practice opportunities for their players and some believed that skill decline under game pressure was inevitable because of it. Also, the lack of exposure to coaches prior to

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becoming a coach themselves means that the study participants' perspective of what it is like to learn through coaching is limited, and they were drawing most of their coaching know-how from coach education courses.

Irwin et al. (2004) examined influences on coaching knowledge and found that previous experience as a performer was cited by coaches as an important factor. In particular, to understand the coach-athlete relationship, appreciate the process of learning skills, and be aware of how skills feel to perform. The data in this study indicated that curling coaches in the main do not have this experience to draw upon and so are relying on coach education; something which was rated as less important in Irwin et al.'s study. This raises the importance of curling coach education content in integrating skill acquisition theory into practice.

The fourth theme to emerge from the data was Types of Pressure. The coaches were aware of peer pressure that comes from playing with clubs, as well as specific game pressure that can lead to a focus on the shot outcome, rather than the technique. This, combined with the lack of practice opportunities, is likely to result in players preferring a quicker 'fix' and more explicit coaching; although this may not be the optimal approach to developing robust skills in the longer term. The coaches were all aware of the pressure of games and the associated drop in player performance that can occur. The coaches' belief that this is due to being distracted by the game outcome would suggest that the skills have not reached automaticity and supports the conclusion of Koedijker et al. (2011) that novices can benefit from implicit learning, but that it doesn't replace the need for practice. The lack of a practice culture (beyond elite pathways) in curling limits the impact of some of their coaching as it is being applied immediately into game settings. This is likely to create pressure for results,

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rather than the space to develop skills, and so may lend itself to more immediate improvement through explicit coaching (Gabbett & Masters, 2011).

Despite this culture within the sport, five of the coaches believed that practice was important to be able to perform skills under pressure later (shown in the Role of Coach theme data). None of the coaches specifically factored the style of learning into building this robustness. Again, this is unsurprising due to it not being included within coach education, but it does highlight the need to broaden the coaches' views away from being purely practice focused. While the theory of deliberate practice (Ericsson et al., 1993) raises the importance of practice for creating expertise, it also includes coach feedback as an important element of that practice.

Another finding for studying performance under pressure was that only one of the coaches noted player performance dropping when being observed by a coach. This casts some doubt on previous studies that used observation to induce pressure (e.g., Law et al., 2003). It should perhaps not be assumed that this would create pressure for all players, as six of the coaches in this study thought it actually led to performance improvements. The performance effects of pressure have been shown to be complex and may be affected by individual aspects such as approach and avoidance coping styles (Wang et al., 2004) and threat appraisals (Jones et al., 2009).

A notable insight from Coach 2 and Coach 4 in the Implicit & Explicit Coaching Awareness theme was that they used different approaches with people who came from more (or less) 'sporty' backgrounds. This may indicate that there is a lot of scope for using implicit learning with those who are not used to, or are not looking for, technical details. This finding supports the view of Hodges and Franks (2002) that discovery learning is an appropriate technique to allow for the importance of the previous experiences of players. For those who

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are coming with expectations that they need to know all the details of a skill, a softer introduction to implicit coaching and a reframing of their expectations of coach communication would be needed. Therefore, the application of implicit/explicit coaching will need to be tailored to the specific curling context. Indeed, as previous study populations have generally been younger and from sporting backgrounds (e.g., Abernethy et al., 2012; Liao & Masters, 2001; Verburgh et al., 2016), this diversity in curling has provided some new considerations.

Implications for Applied Practice and Future Directions

If psychological theory is to be incorporated into coaching practice then it needs to be accessible to coaches as part of their personal development, as well as being presented within their frames of reference. The findings from this study indicate that raising awareness amongst coaches of their role in developing robust skills ought to start at an earlier stage so that coaches of beginners can build it into their skill acquisition sessions.

Specific to curling, the attractiveness to adults without a sports background ought to be considered when new coaching approaches are tested. Future research should explore the impact of player expectations of coaching on how implicit skill acquisition techniques can be implemented. The lack of a practice culture in curling should also be given due consideration when moving to introduce implicit learning. Implicit learning takes longer to embed skills (Smeeton et al., 2005) and therefore practice time (with situational appropriate feedback) would need to be integrated into learning pathways to allow players to benefit from the robustness that should accompany the implicit learning. The coaches' awareness of the pressure felt by players in club games and that it often leads to a focus on game outcome over skill development would indicate that these games are not an appropriate route for practice. Further, the coaches' perception in this study that players play better when watched deserved

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further exploration to establish if it is the case, why it might be, and what players' perspectives are on the difference.

Coaches in this study were using implicit and explicit techniques and there was a desire from some of them to learn more about how they might best be used. This bodes well for the opportunity to integrate the theory into practical coaching in curling. It will require further work with coaches to identify which techniques will best suit curling skill acquisition and exploration of the expectations for coaching style that are brought by the adult participants. This development will also require supporting coach education to help the coaches to strategically use implicit and explicit techniques. This can be aligned with the move towards integrating more constraints-led coaching; lending itself towards implicit learning and facilitating perception-action coupling (Gibson, 1966). Coaches in this study demonstrated that constraints-led coaching is already in limited use (e.g. blindfold curling and short distance games). The shift needed is to broaden coaches' understanding of why these approaches would be helpful for later performance under pressure and increase their repertoire of constraints-led games.

A final area for future research from this study is the distinction in sports that require set-up prior to execution of a skill to investigate where implicit and explicit learning should start and end for optimal skill execution under pressure. If there is a distinction in the stages of the skill that benefit from implicit learning, then this will have an impact on how coach education should be developed. A further examination of implicit and explicit skill acquisition methods for set-up and delivery and the relative effects on performance under pressure will help to give a stronger and more focussed base to any case for change.

An expansion of this research to explore it in other sports would also be beneficial. It is likely that some of the findings would be replicated as aspects such as coach education are

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fairly ubiquitous across sports, but the unique environment of curling may also have influenced the way coaches perceive their role, skill acquisition, and pressure.

Limitations

IPA relies upon a hermeneutic approach (Smith, 2011) and so interpretations are drawn by both the participant and the researcher. This inevitably results in some level of subjective interpretation (Willig, 2008), but this is arguably a strength of the study as it allows researcher reflexivity and ontological idealism to come through. The research itself was carried out by just one researcher (first author) and so a number of steps were taken through rigour checks to reduce the potential for over-subjectivity. The researcher also anonymised the data prior to analysis to limit any influences beyond the data itself and immersion in each transcript was carried out to ensure the coding reflected the actual content.

Participants in this study were aged between 51-68 and so may have presented different experiences and perspectives to younger coaches. The participants though are largely representative of the coaching workforce in curling in Scotland. As the breadth of coach diversity develops, there would be benefit of repeating the study with a wider age range to compare the findings.

The semi-structured interviews used in this study led to different conversations with each participant. Therefore, it is possible that some coaches did not mention something, not because they do not think it, but because the interview did not take that direction (Hopf, 2004). This may have led to artificial differences between the participants. This does not negate the benefits of using this approach, however, as it helped the participants to speak freely and be honest about their thoughts on their coaching (Sparkes & Smith, 2013).

Conclusions

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This study has explored the application of skill acquisition theory for creating skill robustness under pressure through the understanding of the coaches who teach early skills in curling. This approach has highlighted important factors for moving the theory into practice, as well as identifying potential new areas for study. The recognition of the pressure that players will face in games and the potential for implicit techniques to be employed by the coaches demonstrated positive prospects for the application of implicit/explicit skill acquisition theory. The findings are likely to be generalisable to some other sports where closed skills are integral (e.g. golf, gymnastics, basketball free throw). The focus of coach education and the lack of links drawn by coaches between early skill acquisition and later performance is generalisable across many sports though and additional investigation of this link would be beneficial.

The coaches in this study also drew attention to a need for greater understanding of the distinction between set-up for a motor skill and the delivery of the skill. This has not previously been considered in the implicit/explicit skill acquisition studies that examined the impact on performance under pressure. Exploration of this gap in the current literature could have significant influence on the recommendations for coaching in sports such as curling and golf. Having a greater understanding of coaches' appreciation of their role in creating robust skills will be important for the application of the theory across all coaching contexts.

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COACHES' AWARENESS OF RESILIENCE VIA SKILL ACQUISITION

Supplementary Materials 1

Vignettes

1. Sheena is one of your virtual club players and has been curling for a year. You have repeatedly explained to her to extend her trailing leg when she comes off the hack. During a practice session, you watch her from a distance complete several smooth slides with leg extended. However, when she starts to play a game later in the session, she consistently bends her leg and puts her knee down in her slide, [resulting in inaccurate shots].
    o   How would you coach Sheena during the game?
    o   How would you coach Sheena during her next practice session?

2. Ross is a newcomer to the virtual club. He has had 4 beginner curling lessons and has been at the virtual club for 2 weeks. He asks you about how to improve the accuracy of his shots as he gets reasonable weight, but his line is often inaccurate.
    a. How would you respond to Ross's question?
    b. How would you decide what information to give him in your response?

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