



## An Investigation of In Situ Cognitions of English Premier League Academy Football Coaches Using Stimulated Recall and Think Aloud Protocol

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### Article Info

#### Article history:

Received: March 27, 2024

Revised: April 21, 2024

Accepted: May 16, 2024

#### Keywords:

Coaching;

Cognitions;

Stimulated recall;

Think aloud protocol.

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### Abstract

Coaches must practice and mentally operate in complex social environments. However, research that has explored the mental processes of coaching is limited and has tended to employ singular methods. The purpose of this study is twofold. First, to understand what and how coaches think by combining two established knowledge elicitation. Think Aloud Protocol (TAP) and Stimulated Recall (SR). The two methods, working in conjunction, complement one another and cater to each other's shortcomings. Second, to examine the effectiveness of combining methods for the coach development sphere. This study used six English Premier League academy male football coaches who participated in both 'live' and 'retrospective' methods. For aim 1, a reflexive thematic analysis of the transcripts of the two combined methods resulted in developing two primary themes: Session management and noticing. These themes are populated with content to illustrate the subject of the coaches' thoughts. For aim 2, a reflexive thematic analysis of the coaches' reflexive interviews regarding their experiences of the methods displays the issues presented with each isolation method. Finally, the study reports on the effectiveness and possible deployment of the new method, which we propose as TAPSR and possible future applications for various stakeholders in the coach development realm. The novelty of this work has potential application to the applied world of sports coaching and contributes to the development of a more sophisticated knowledge elicitation method.

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**To cite this article:** Chapman, M., Quick, S., & Freeman, P. (2024). Investigating in situ cognitions of english premier league academy football coaches using stimulated recall and think-aloud protocol. *Journal of Coaching and Sports Science*, 3(2), 99-112. <https://doi.org/10.58524/002024335600>

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### INTRODUCTION

Sports coaching literature has evolved to contain many sub-disciplines, including psychology, sociology, policy development, and coach education (Lyle, 2018). Of these 'schools of thought,' research on coaching expertise (from psychology) has often engaged singular knowledge elicitation methods. Individual methods, while useful, offer a partial insight into how coaches mentally operate *in situ* in their unique coaching context. Subsequently, there has been a call for more *in situ* research to understand better how coaches mentally operate within their environments (Roca et al., 2022). Overwhelmingly, much of the existing research has used methods to capture athletes' *in situ* (i.e., in the moment) cognitions. However, research about *in situ* coaching cognitions is scant.

Sports coaching research examining the psychological processes of coaches includes, amongst others, coaching cognitions, coaching knowledge, mental models, and decision-making (Araújo et al., 2020; Côté & Gilbert, 2009; Harvey et al., 2015). Quick (2022) coaching cognitions are "activities and processes that occur inside the coach's head, while coaches are operating in a particular environment and context" (p. 21). Exploring coaching cognitions, however, can present challenges to researchers due to the environment that coaches work in (Araújo et al., 2020). For example, coaches need to be able to engage with others in the sessions, which impacts the direct access to their *in situ* cognitions (Araújo et al., 2020; Quick & Lyle, 2024). Quick (2022) found that, as part of coaches' *in situ* practice, coaches experience distinctive cognitive demands, which require coaches to consider how they act when in the presence of athletes. Further, coaches sought to gather information by continually noticing and questioning, yet were required to intervene continuously with instruction and feedback to athletes.

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According to Côté and Gilbert (2009), coaching knowledge is a primary characteristic of an effective coach. As part of their model of expert knowledge, Gilbert and Côté (2013) identified three main components: Professional knowledge, interpersonal knowledge, and intrapersonal knowledge. Professional knowledge is the specialized knowledge required to coach (Collinson, 1996). This includes sports science, sports-specific knowledge, and pedagogical knowledge (Abraham et al., 2006). Interpersonal knowledge is interacting with others (Côté & Gilbert, 2009). Coaches are responsible for communicating with players, staff, parents, and others (Côté & Gilbert, 2009). Finally, intrapersonal knowledge is understanding oneself and the ability to self-reflect (Côté & Gilbert, 2009). Gilbert and Trudel (2005) highlighted the importance of this skill as it allows coaches to translate experience into learning. This is vital for elite coaches to do as their experiences of their environment will guide their decision-making.

Decision-making is a key feature of coaching expertise (Collins et al., 2022; Harvey et al., 2015; Vergeer & Lyle, 2013). Decision-making research has sought to uncover how a decision has been made, for example, by unpacking a specific event (Harvey et al., 2015). This line of research has resulted in various conceptual models of coaches' decision-making (Abraham & Collins, 2011). Within the literature, there are two main approaches to the decision-making process (Debanne & Laffaye, 2015): Naturalistic Decision Making (NDM) (Klein, 1993) and Professional Judgment Decision Making (PJDM) (Collins et al., 2022; Abraham & Collins, 2011). Although different, both approaches offer insight into the cognitive processes underpinning a coach's decision and how knowledge is acquired to inform those decisions (Côté & Gilbert, 2009; Lyle & Muir, 2020).

PJDM was presented as a unifying concept and an alternative way to consider how coaches make decisions (Abraham & Collins, 2011). PJDM is on a continuum and considers that the coach's environment is continually changing, which places different levels of demand on a coach (Martindale & Collins, 2013). However, much research into PJDM has been conducted within controlled conditions to explain human decision-making, often through experimentation and testable hypotheses (Till et al., 2019). Raab (2012) proposed that PJDM research is unsuitable for addressing the research requirements of coaching cognitions because it does not consider rational decision-making factors, such as time constraints and the complexity of the session.

NDM is a decision-making paradigm that explores how expert coaches can order their experience to make informed decisions at an unconscious level in constantly changing and dynamic environments (Harvey et al., 2015; Lyle, 2010; Vergeer & Lyle, 2009). Many NDM models exist, including Klein's (1993) Recognition-Primed Decision Model (RPD). The model describes three functions (experiencing, analyzing, and implementing the decision), which show the decision-maker's process of coming to a solution within their contexts (Debanne & Laffaye, 2015). The RPD Model is an example of how NDM is how coaches scan specific stimuli within their environment under the pressure of time (Abraham & Collins, 2011; Lyle & Muir, 2020). This model highlights the processes coaches go through when making decisions and how they relate their learnings from experience to the stimuli in the session (Debanne & Laffaye, 2015).

Research within the NDM paradigm has used many methods, such as after-action reviews and cognitive task analysis (Lyle & Muir, 2020). Each of these methods has strengths and limitations. However, it is yet to be explored how a 'blending' of methods might act in a complementary fashion and, therefore, overcome the limitations accompanying singular methods. The present study focuses on two prominent knowledge elicitation methods, Stimulated Recall and Think Aloud Protocol, in the sports coaching literature (Whitehead, 2015; Whitehead et al., 2016; Whitehead & Richards, 2019; Whitehead & Jackman, 2021; Lyle, 2003; Quick, 2022).

SR is a common method used as an after-action review and has been widely used in research into NDM and education (Harvey et al., 2015; Lyle, 2003; Lyle & Muir, 2020). SR allows researchers to investigate *in situ* decisions. SR is a procedure in which participants' actions are recorded and then replayed back to them, typically on a screen, to recall memories to capture cognitive activity. The researcher then asks questions to help encourage further insight from the participant. Researchers have acknowledged limitations with SR when examining the cognitive processes (Roca et al., 2022) and memory decay (Gass, 2001; Whitehead, 2015) if participants carry out SR a long time after the event (Gass, 2001). Specifically, participants may be unable to reflect on the event and communicate their thoughts (Ericsson & Simon, 1980; Nicholls & Polman, 2008).

Further, SR may be limited by the footage recorded and shared with participants, which might give them a different viewpoint and, therefore, replace what they were thinking at the time of the event with what they saw in the SR footage (Bowles, 2018, Quick, 2022). Despite its limitations, SR is an important method for exploring cognitive activities as it allows coaches to focus their attention without interference (Flett et al., 2016). SR can also overcome the problem of memory decay through the stimulus of the footage to help participants recall memories if it is used within 48 hours and with carefully thought-out prompts from researchers (Bowles, 2018; Gass & Mackey, 2016).

Researchers have used TAP to better understand athletes' *in situ* cognitive processes (Swettenham et al., 2020; Welsh et al., 2018; Whitehead & Jackman, 2021). In addition, it has been used as a tool for reflection and facilitating experiential learning (Whitehead et al., 2016; Whitehead & Richards, 2019). TAP allows researchers to capture the inner thoughts and short-term memory of the participant through their verbalization of thoughts as they arise (Ericsson & Simon, 1993; Whitehead, 2015), three levels of verbalization (Eccles, 2012; Ericsson & Simon, 1993). Level one TAP is the vocalization of inner speech, where the participant does not need to consciously communicate their thoughts (Ericsson & Simon, 1993; Whitehead, 2015). Level two involves the participant articulating thoughts that are not originally verbalized (Ericsson & Simon, 1993; Whitehead, 2015). This level adds to Level One as it provides insight into the participant's focus. Finally, Level Three entails participants explaining their thoughts and ideas (Ericsson & Simon, 1993; Whitehead, 2015).

TAP, however, has limitations in certain contexts (Jääskeläinen, 2010; Quick, 2022; Whitehead & Jackman, 2021). First, only the information actively processed in the working memory can be verbalized. This means researchers cannot access the unconscious processing (Jääskeläinen, 2010). Second, using Level Three verbalizing can be difficult for participants because it requires additional attention from the participant beyond their usual duties, which may affect performance (Whitehead, 2015). However, it is important to note that the creators of TAP, Ericsson and Simon (1993), recommended against collecting level 3 verbalizations *in situ*. Despite its limitations, TAP is a valuable method for capturing and exploring the inner-mental workings of *in situ* coaching. It also provides reliable, albeit partial, insight into coaching cognitions (Jääskeläinen, 2010). Given the respective strengths and limitations, SR and TAP could be combined to offer more complete insight into coaching processes. TAP can accurately capture *the in situ* cognitions of coaches as it allows them to verbalize their thoughts while coaching (Whitehead, 2015). TAP can potentially overcome SR's limitation of the accuracy of SR data due to memory decay (Bowles, 2018; Gass, 2001; Nicholls & Polman, 2008). However, as TAP only shows glimpses of a cognitive thought process, participants will likely find verbalization difficult (Ericsson, 2006; Jääskeläinen, 2010; Whitehead, 2015). Employing SR could reasonably overcome the limitations of TAP as it allows coaches to view a stimulus that enables recall moments and then discuss, explore, and reflect on them in depth after the event (Flett et al., 2016).

Given the state of play within the literature, this study is 1) to develop a more sophisticated understanding of *what* practicing academy football coaches think and 2) to evaluate the effectiveness of methods available to researchers and coach developers in sports coaching. Table 1 summarizes how the strengths of the methods complement each other. Through the combination of both SR and TAP, this new method (TAPSR) can provide a richer insight into what and how coaching thinks *in situ*.

**Table 1.** Methodological Strengths Vs. Weaknesses

| Methods                     | Strengths                 | Weaknesses             |
|-----------------------------|---------------------------|------------------------|
| <b>Stimulated Recall</b>    | Visual and audio prompts  | Memory Decay           |
|                             | No interference in-action | Advance Perspective    |
|                             |                           | Reordering Events      |
| <b>Think Aloud Protocol</b> | Captures verbalization    | Unconscious processing |
|                             | Verbalizations in-actions | Affect Performance     |

## METHOD

### *Research design*

This research is informed by a social constructivist epistemology (i.e., knowledge is socially generated due to interactions) and relativist ontology (i.e., reality is subjective and only exists through individuals' experiences). The lead researcher worked full-time as a coach developer and performance analyst at the football academy. The second researcher had conducted previous research using TAP and SR in different sports. The lead researcher's connections provided opportunities to work with coaches and players to gain access to the training sessions. The research team attempted to make sense of the participants' sense-making to gain an understanding of the participants' thought processes. To consider the potential problems of inter-rater reliability, a research team member with expertise in SR and TAP was used to confirm the data collection and analysis were plausible and defensible (Smith & McGannon, 2018).

### *Participant*

A purposive sample study of six part-time football coaches was recruited, all from the same Category 1 Premier League Club. Coaches were required to have a minimum of a UEFA B coaching qualification and to have been working at the academy for a minimum of five years. Table 2 displays the details of the participants in the study. Each of the coaches worked with a specific age group in the academy. However, all the coaches worked with players aged nine to fourteen. By working with their age group during the study, coaches could know the strengths and weaknesses of individuals within the team while knowing the club's playing philosophy within their age category.

**Table 2.** Table of the Participants' Information

| Coach Number | Age Group | Years of Experience | Experience at Academy | Years at Current Club | Qualifications |
|--------------|-----------|---------------------|-----------------------|-----------------------|----------------|
| 1            | U9        | 17                  | 7                     | 7                     | UEFA B         |
| 2            | U10       | 15                  | 7                     | 3                     | UEFA B         |
| 3            | U11       | 17                  | 9                     | 2                     | UEFA B         |
| 4            | U12       | 15                  | 9                     | 9                     | UEFA A         |
| 5            | U13       | 12                  | 9                     | 2                     | UEFA A         |
| 6            | U14       | 7                   | 5                     | 1                     | UEFA B         |

### *Procedures*

At the outset, the participants undertook a twenty-minute online seminar on SR and TAP. This was created and presented with another academic on the research team with expertise in SR and TAP. During this session, it was explained that participants were not expected to verbalize level three data as SR was intended to account for this data. All coaching sessions were recorded at the club's training ground. The six coaches were observed practicing twice, and a combination of TAP and SR was used during and after each session. The length of the sessions ranged from 60-90 minutes. A wireless microphone for TAP was placed on the coach's collar during the coaching session. The microphone was linked to the club's camera, which was mounted on a high tripod overlooking the football pitch. The lead researcher was present at the training sessions to speak with coaches before and after. The lead researcher later transcribed the audio footage from TAP.

Following each coaching session, SR was used, and the coaching session footage was shown on a laptop. The lead researcher and coaches met between 24-48 hours after the coaching session had taken place. The lead researcher first identified key incidents, which were then proposed to the coach. The coach and researcher discussed the proposed incidents and agreed which were most significant in the context of the session. The video footage containing the key incidents was played for the coach and, when necessary, paused by the researcher to ask questions (interrogate) and prompt the coach to verbalize their thought process alongside their verbalization. The lead researcher later transcribed the audio footage from SR. Following data collection from both methods, the participants were interviewed to discuss their thoughts and feelings on both methods. These interviews were recorded using a Dictaphone and later transcribed.

A University ethics committee granted ethical approval, and written consent was provided by all the participants, as well as the football club where the coaches worked. Participants were informed of the purpose of the study and that pseudonyms would be used to protect identities (Kaiser, 2009). Before the study, the club's Academy Head of Safeguarding was consulted about its purpose and procedures. The football club accepted that players would be filmed during this study as consent had been given under the academy's umbrella policy, which allowed filming for analytical purposes. All collected data was stored on a protected server per the University's ethical procedures.

### *Data analysis*

#### *Aim 1: To understand what and how coaches think using TAPSR*

Once the data were transcribed, a reflexive thematic analysis was used (Braun & Clarke, 2019). The lead researcher and researcher with expertise in TAP and SR engaged in data immersion and familiarization. A total of 73 incidents were examined through the TAP video footage and audio data. Incidents were akin to 'coaching moments,' whereby the researchers decided that a critical event/situation occurred. An incident is now shared with the reader to aid clarity and provide an example. During a coaching session, coach #5 noticed technical aspects of a player's passing that had led to a drill breaking down several times. This observation happened over two minutes. The coach commented, "He was under tonnes of pressure, he wasn't prepared to receive, and Player X didn't look to play over the press...he fired the ball in as well; he was asking for a turnover". For this study, the identification of coaching incidents allowed larger quotations to remain intact, thus ensuring that the data remained connected and contextualized. Two of the research team were qualified football coaches who acted as a resource within the data interpretation process. This allowed the data to be coded and allowed the development of first-order themes (Braun & Clarke, 2019).

Further analysis of the data by the researchers resulted in second-order themes, which were populated with coaching quotations (Braun & Clarke, 2019). Two first-order themes and subsequent second-order themes were developed, thus providing more detailed 'content' of coaches' thoughts. The coding process was performed using Microsoft Excel to easily share units between the research team during the analysis phase. Within Microsoft Excel, the cells were color-coded by the researcher, which allowed the researcher to distinguish which method was used to capture the data.

#### *Aim 2: To gather coach reflections on the methods*

The semi-structured coach interviews (on reflections) were transcribed verbatim. The data were analyzed using a reflexive thematic analysis (Braun & Clarke, 2019). To begin, first-order themes were developed under the umbrella methodology (i.e., TAP or SR). Three first-order themes were developed for each method. Table 4 illustrates the developed themes and is populated with exemplar coach quotations.

## **RESULTS AND DISCUSSION**

### **Result**

This section is presented in two parts. First, the coaches' cognitions and the development themes are discussed. Second, the coaches' thoughts on the method are presented and explored. In line with the paper's aims, that section will discuss TAPSR as a method in its own right. The reflexive thematic analysis of the coach's cognitions led to the developing of two primary themes: Session management and noticing (see Table 3). Data showed that coaches were conscious of managing the session throughout, which meant that they engaged in mental models, introspective considerations, contextualization of coaching activities, and timekeeping. The data illustrates that coaches noticed key pieces of information such as technical, tactical, club philosophies and values, and players' individual needs.

**Table 3.** Reflexive thematic analysis of in situ coaching cognitions

| Primary Theme             | Secondary Theme                | Meaning Units  |  |
|---------------------------|--------------------------------|--|--|
|                           |                                | Think Aloud  | Stimulated Recall  |
| <b>Session Management</b> | Mental Model                   | "I'm going to slightly change it because this one-two in the corner is kinda breaking it down."                                      | "I considered the relation to the theme, which was final ball execution. The one-two was not bringing out the final ball execution as the pass was always going to feet, so they weren't getting outcomes from the through ball... I felt I needed to challenge them with a through ball, which kind of goes in behind." |
|                           | Contextualization of Practices | "To make this practice more difficult...as it seemed too easy to score...so what I am going to do is add a progression to the game." | I wanted to make it more realistic, as all they had to do was find the player who was making a run into the best. Now, there is a defender. What decision are you going to take? I wanted to see their decision-making."   |
|                           | Time Keeping                   | "I am conscious of stopping the session too often, so I will try and not do that."   | "We split the group, so it is important that we are in sync with our timings. Between us, I have taken the role of being on the clock and transitioning into the next activity."   |
|                           | Introspective Considerations   | "Want them to take ownership."   | "My go-to intervention is command or Q&A. It was very coach-heavy at the start. They understand the constraints, the rules, and the practice. Now, at this point, I've stepped in, and they are sick of hearing my voice. Now, let's see how much information they have taken in."                                       |
| <b>Noticing</b>           | Tactical Observations          | "So, they have reverted to being narrow and in the line of the ball."  | "We've spoken loads to wide players about that movement when you see someone cut in. Wide players have to secure the back post."   |
|                           | Technical Observations         | "Oh, good touch on the back foot. We saw Player X receive on the back foot and was slow to play forwards there."                     | "His first touch was positive. His first was his back foot, which allowed him to go onto his other side, which is how we want to play."  |

| Primary Theme | Secondary Theme            | Meaning Units  |   |
|---------------|----------------------------|--|---|
|               | Club Philosophy and Values | "No, Player X, do it again. Not acceptable"  | "Communication is a key value... taking that into a game day when we are not with them; they have to have these tools whereby they can deliver messages on their own and solve problems at the moment," |
|               | Individuals                | "So, I pulled Player X because I know his communication is really good, and I want him to try to get some information to his teammates on how they can defend and keep that 1-0 lead." | "It was a pass between two players and a through ball. That is the IDP that he was working on... He incorporated it into the practice. I wanted to praise him as he is working on his IDP."             |

### Session management

Four secondary themes were developed under the primary theme of session management. The themes illustrate the specific considerations of coaches when managing a session. Session management is one of the key elements of a coach's role, whether it is adapting a practice or dealing with individuals. Coaches must be able to identify problems and then come up with solutions (Lyle, 2018). *Mental Models*

The data showed that within some training sessions, there was a disconnect between what the coach saw and what the coach expected (i.e., a mental model). This meant that the practice had not worked as the coach had anticipated. Coaches within the study found themselves continually responding and adapting their coaching practices due to the disconnect between events unfolding and their mental model of the coaching activity. For example, when referring to a passing practice, Coach#2 decided, "I'm going to slightly change it because this one-two in the corner is kinda breaking it down." This shows the coach recognized that the practice was breaking down and needed to modify the session against what was planned (Harvey et al., 2015). In another illustration, Coach#2 further explained, "The one-two was not bringing out final ball execution as the pass was always going to feet, so they weren't getting outcomes from the through ball." These illustrations provide examples of what the coach needed to process and the details of what they saw before deciding how best to adapt the practice.

The study data suggests that due to the coaching process and uncertainty in player numbers, coaches were forced to accommodate and adapt coaching activities. For example, Coach#1 explained, "The numbers wouldn't work...doesn't allow what we need in practice". This suggests that coaching practice can be constrained by the number of participants (i.e., drill design requires knowledge of numbers to be effective). This is problematic for coaches in many respects. For example, planning, a key coaching feature, requires coaches to devise activities linked to sessional goals. However, when participant numbers fluctuate between sessions, coaches must consider contingency planning. Over time, this will likely lead to a decrease in coaching effectiveness.

### Contextualization of practices

Contextualization of practices focuses on how appropriately a coaching activity simulates what will occur in competition. This is intended to help with player development over a period. Illustrating this point, Coach#2 wanted "to make this practice more difficult....as it seemed too easy to score... so what I am going to do is add a progression to the game". Coaches must understand what is (or is not) satisfactorily working to make situational adjustments. In this fashion, their knowledge is

drawn on as a resource to adapt appropriately to the practice, making coaching activities more game-realistic (Côté & Gilbert, 2009).

#### *Timekeeping*

Timekeeping management was an aspect to which many coaches were attentive. Coach#4 explained, "*I am conscious of stopping the session too often, so I am going to try not to do that.*". The data suggests that coaches were managing time with a specific view to how often the ball was in play (in football terms, this is expressed as 'ball rolling time'). The results show that coaches had to consider the physical load that the players were under, as well as the amount of time players had to practice. This is because coaches followed a set time structure set by the club and had to work with other coaches around them (Junggren et al., 2018).

#### *Introspective considerations*

In this study, the data suggests that coaches had influential introspective considerations when they managed the session. For example, Coach#5, referring to the players in the practice, said they "*Want them to take ownership.*" To elaborate further, Coach#5 said this to themselves as they wanted to give less instruction to players while playing. Coach#5 said, "*My first go-to intervention is command or Q&A ...it was very coach heavy at the start.... they understand the constraints, the rules, the practice. Now, at this point, I've stepped in, and they are sick of hearing my voice. Now let's see how much information they have taken in.*" This suggests that coaches continuously think critically about how to work with players. The findings also reveal that coaches were often aware and considerate of their language with players and *when* using it (Mouchet et al., 2014). Coaches needed professional and interpersonal knowledge to identify what was happening and choose the best way to interact with the athletes (Abraham et al., 2006; Côté & Gilbert, 2009).

#### *Noticing*

The primary theme of noticing was developed into four secondary themes (Mason, 2002). Noticing is key for coaches as they must take in information to make decisions informed by their professional knowledge (Côté & Gilbert, 2009). Through noticing, coaches can intentionally direct their focus to where it is best needed or required. Expert coaches can recognize and judge more relevant information and attach meaning better than novice coaches (Nishihara and Uchiyama, 2022). Noticing can also help coaches develop knowledge as they can capture and learn from events (Jones et al., 2013).

#### *Tactical observations*

The study's coaches regularly observed the tactics during the session. During one practice, Coach#6 observed that "*they have reverted back to being narrow and in the line of the ball.*" This suggests that coaches have the ability to notice tactical events (Nishihara and Uchiyama, 2022), which helps them with their judgment and whether they need to resolve a problem (Cloes et al., 2001; Harvey et al., 2015).

#### *Technical observations*

Coaches frequently observed the technical aspects of training. Coach#3 said after a player received the ball, "*Oh, good touch on the back foot. There we saw Player X receive on the back foot and was slow to play forwards.*" In this case, the coach recognized the good and bad sides of how the player received the ball. This technical noticing facilitates coaches to make evaluations and thus determine if an individual, group, or team needs to develop a technical skill (Saury & Durand, 1998).

#### *Club philosophy and values*

This secondary theme was developed due to the significance of the relationship between the coach's noticing and the environment in which they operate (i.e., club or domain). Coach#3 explained, "*Communication is a key value [of the club] ... taking that into a game day when we are not with them, they have to have these tools whereby they can deliver messages on their own and solve problems at the moment.*". This data indicates that coaches in academy environments need to consider the ideas of the clubs they are working in (Junggren et al., 2018). This would require both



professional knowledge and an understanding of their working context (Abraham et al., 2006; Saury & Durand, 1998).

### Individuals

Coaches were found to notice and adapt to their players' needs. This means that they also needed prior knowledge of the players' individual strengths and weaknesses. Coach#2 illustrates this by encouraging a player to lead a team talk. He explained, "*I pulled Player X as I know his communication is really good, and I want him to try to get some information to his teammates on how they can defend.*"

To keep track of players' progress, the club made Individual Development Plans (IDP) for each player. This meant that coaches could refer to each player's IDP while training. After a player had made a good pass, Coach#2 praised them for it. Coach#2 explained, "*It was a pass between two players and a through ball. That is his IDP that he was working on...he incorporated it into the practice. I wanted to praise him as he is working on his IDP.*". In both instances, the data indicates that coaches consider the individual athlete's strengths and weaknesses within a training session. Coaches need to be able to access this interpersonal knowledge to cater the session to individuals (Gilbert and Côté, 2013).

## Discussion

### An evaluation of TAPSR effectiveness

Central to this body of work is reflecting on the effectiveness of TAPSR as a new method. This section will discuss the method used within this study and include the presentation of the findings from the study. These results are presented below in Table 4.

**Table 4.** Reflexive thematic analysis of findings on methodology

| Method                      | Theme                   | Meaning Units  |
|-----------------------------|-------------------------|--|
| <b>Think Aloud Protocol</b> | Comfort                 | "It felt comfortable within the session. I didn't do anything different from what I would normally do. The only difference would be that I was using the mic...I could share my ideas and thoughts through the mic." |
|                             | Discomfort              | "I am not used to speaking into a mic; it's a bit weird."  |
|                             | Prompts                 | "You would definitely help as you would be able to prompt."  |
| <b>Stimulated Recall</b>    | Recalling Events        | "It flags up things that go through your head..."  |
|                             | Time Between TAP and SR | "Life happens, and you have a million and one things: work, life, family life, etc. I struggled to put myself back where I was."   |
|                             | Reflection Tool         | "When watching it, I look at certain players to see if I have missed anything...I can go back and reflect."  |

### Comfort

The data suggests that some coaches did not notice being recorded. Coach#2 explained, "*It felt comfortable within the session. I didn't do anything different from what I would normally do*". This may be because coaches have experienced similar situations before, as they were required to be recorded for coach education purposes. Coach#2 also commented, "*Being recorded now, I have experienced for several years...I don't find the recording difficult*". This illustrates that when recorded,

the participant's effectiveness to perform was not hindered from being recorded (Whitehead, 2015). However, although coaches were comfortable with being recorded, it does not necessarily mean they will generate data.

#### *Discomfort*

In contrast to the above, the data also suggested that some coaches felt uneasy when verbalizing. Coach#4 said, "*I am not used to speaking into a mic; it's a bit weird.*" This suggests that, even though participants were comfortable being recorded, they felt uneasy talking into the microphone (Eccles, 2012). The findings, perhaps unsurprisingly, bring into question the effectiveness of TAP as a singular method.

#### *Prompts*

During the study, some participants struggled to verbalize their thoughts, particularly at the start. Coach#5 suggested that "*It would help you [i.e., a coach], would definitely help as you [the researcher] would be able to prompt.*" After being questioned, Coach#5 said that prompts would have helped "*to use TAP more*" and that it would have made them "*a lot more conscious of talking to the mic.*" This suggests that prompts could be effective when using TAP to help the participant with verbalization (Bowles, 2018).

#### *Recalling events.*

In the study, SR succeeded in memory recall when the method was used within 48 hours of the participants' recording. Coach#5 said, "*It flags up things that go through your head.*" This shows that SR is an effective method of prompting the participants to think back to a certain event (Lyle, 2003; Whitehead, 2015).

#### *Time between think-aloud protocol and stimulated recall*

Unfortunately, during the study, SR had to be used over 48 hours after recording participants. Coach#5 explained, "*Life happens, and you have a million and one things...work, life, family life...*". Expanding on this point, the same coach "*struggled*" to remember when they were recorded. This confirms that if SR is used after too long, memory decay will occur, and participants could find it difficult to recall events (Gass, 2001). Researchers need to consider that part-time coaches have busy schedules; therefore, full-time coaches may be able to dedicate more time to engaging in knowledge elicitation methods.

#### *Reflection tool*

The study also confirms that SR is a useful tool for coaches' self-reflection, even if it is not one of the desired outcomes. Coach#2 said, "*When watching it, I look at certain players to see if I have missed anything...I can go back and reflect.*" This indicates that SR is an effective method for reflection as it allows coaches to self-evaluate their performance from a new viewpoint (Lyle, 2003; Tjeerdsma, 1997). However, the purpose of capturing *in situ* cognitions of coaches may have caused issues with the method. This is because it confirmed that the participant's memory may be hindered by being given a new viewpoint (Bowles, 2018). Therefore, the participants may have been giving a skewed idea of what they were thinking while they were coaching, which meant that some of the data may not be completely accurate.

**Implications** This research combines Stimulated Recall (SR) and Think think-aloud protocol (TAP) methods to offer a more detailed and accurate understanding of coaches' *in situ* cognitive processes, enhancing the development of effective coaching strategies and interventions. Research advances the sports coaching field by validating the TAPSR method as a comprehensive tool for capturing real-time coaching cognitions, providing valuable insights for researchers and practitioners in coach education and development. **Limitations** The research faced challenges such as potential memory decay when SR was conducted after 48 hours, participant discomfort with using microphones for TAP, and the possibility of altered recall due to different perspectives during SR sessions. **Suggestions:** future studies should reduce memory decay by conducting SR sessions sooner, improve participant comfort with TAP equipment, and ensure the accuracy of SR data by addressing

the influence of new viewpoints. Expanding research to include full-time coaches and various sports contexts will further validate and enrich the findings.

## CONCLUSION

### *Cognitive findings*

Findings from this study have shown how coaches draw upon professional, inter-personal and intra-personal knowledge. This knowledge has been gathered through coach education courses, experience, or instilled by their work environment. This knowledge is then drawn upon and engaged in managing training sessions, for example, adapting practices to make them fit the needs of the players or considering how to interact with individuals. Knowledge was also used to help coaches notice different aspects within training sessions, such as a player's technical and tactical ability. By having this knowledge, coaches could then understand how to support the individual athletes with the session. The findings of this research suggest that coaches are required to notice and draw upon a vast amount of in-session information. In turn, coaches are required to negotiate and reconcile the athletes' demands with the academy's needs.

### *Final Judgements and recommendations for the use of TAPSR*

The study found that the new method of TAPSR could capture data on the *in situ* cognitions of coaches holistically (when comparing the two methods separately). This can reasonably be assumed to be because TAPSR allowed cognitions to be captured 'in action', while also allowing the participant to retrospectively consider the events and further recall information. The study has shown that, even though TAPSR can be used to collect *in situ* cognitions, there is a question of how best to combine the methods to generate data. This is suggested because TAP does not enable researchers to capture fully accurate data from verbalizations due to participants' discomfort in verbalizing their thought processes. Moreover, SR hinders this method due to the memory decay of the participants and the new viewpoint given to them when using the method. However, TAPSR has been shown to offer a more sophisticated approach than either of the two methods in isolation. The current research indicates that TAPSR has significant potential for coach education and development because the method allows moments in a coaching session to be captured for self-evaluation and the retrospective unpacking of cognitions concerning in-session events.

## AUTHOR CONTRIBUTION STATEMENT

MC was responsible for the study's conceptualization and design, leading the data collection efforts and drafting the initial manuscript. SQ participated in the data analysis and provided critical revisions to the manuscript to enhance its intellectual content. PF contributed to the data interpretation and played a key role in the final approval of the manuscript for publication. All authors reviewed and approved the final manuscript.

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