Post-match video-based feedback: A longitudinal work-based coach development program stimulating changes in coaches' knowledge and understanding

Abstract

The literature regarding formal coach education and development highlights issues of transference of usable knowledge to the real-world context. This study sought to engage coaches from a Spanish football academy in a longitudinal work-based coach development program (CDP) focused on the delivery of post-match feedback. The CDP was delivered over a 23-month period through collaboration between a sport pedagogue researcher-practitioner, the Academy Management Team, and an experienced research team. The study adopted a case study design, utilizing a multiple method data collection strategy that occurred in several stages: 1) Systematic observations (Sep-Dec 2018) and 2) debrief (Jan 2019), where baseline coach behaviors and underpinning knowledge were recorded; 3) a workshop and a directed task (Mar 2019), encouraging coaches to apply new knowledge; 4) a directed task 2 and reflective interview (Apr/May 2019), facilitating coaches' reflection on their past deliveries and rationalization and planning of their forthcoming sessions' delivery and 5) a consolidation interview (Apr 2020), capturing knowledge stabilization. Qualitative data suggest that there was an increased understanding in the adoption of behaviors including corrective feedback, silence, questioning, and player participation throughout the CDP. In addition, coaches' self-reflection found acceptance of their coaching delivery or a disconnect between their desired and actual behaviors during the delivery of video-based feedback. This study provides a preliminary framework for further implementation and exploration in developing coaches' knowledge and understanding of delivering post-match video-based feedback.

Key words: coach education; coaching behaviors; knowledge development; post-match.

Introduction

Coach development programs (CDP) have received considerable attention in recent years for their perceived impact on coaching practice.[1] It has been suggested that coaches learn through formal (i.e., accredited courses), non-formal (i.e., workshops, talks, etc.), and informal (i.e., day-to-day coaching, observations or discussions with other practitioners) modalities,[2] although these rarely occur in isolation.[3] Whilst formalized CDPs have been criticized for being too theoretically driven and de-contextualized from practice, the informal mode is suggested to be more effective for coach learning.[4,5] However, the effectiveness of CDPs has often been claimed by showing behavior change at post-intervention stages.[6]

The impact that formal CDPs have on coaches' development has been questioned because these events result in limited changes of knowledge and behavior.[7,8] For example, Stodter & Cushion[9] examined the development of two coaches after participating in a National Federation's 'Youth Coaching Module'. Their findings suggested coaches' rejection of new concepts due to incompatibility with previous knowledge or lack of application within their contexts. Similarly, Stodter and Cushion[6] compared the learning of coaches in a formal coach education group and a group of coaches who did not take part in any CDP. Coaches in the education group demonstrated increased understanding of the use of questioning and whole-part-whole structures, though this translated to minimal changes of behavior. It was suggested that the ineffectiveness of this CDP might be due to coaches' utilization of different approaches without critical consideration of their implications. Therefore, coaches appear to relay on behaviors that have previously worked, not necessarily meeting their players' needs.

Reflective practice has been proposed as a helpful mechanism that supports coaches to think more critically about their practice,[10] and brings tacit knowledge from

54 the sub-conscious to conscious level.[11] Thus, examination of behavioral data, video-based
55 feedback, and peer conversations have been employed to facilitate reflective practice of
56 youth coaches from different sports.[12,13,14] Nonetheless, coaches appear to merely
57 describe their plans and intentions without questioning its validity (i.e., single-loop
58 learning)[14] rather than comparing their ideas and reasoning about coaching against their
59 actual behaviors and underlying rationales (i.e., double-loop learning). [15]

60 CDP implemented by National Governing Bodies (NGBs) has been compared to
61 a process of indoctrination and control[4,16]. For example, coach developers working for
62 the NGB and supporting youth coaches in their clubs have been shown to adapt the
63 meaning of 'player-centered' in their interest to dominate coaches[8]. In contrast, Cope et
64 al.[17] found that an unaffiliated coach educator empowering coaches and assisting them
65 with reflective conversations enhanced their experience. Furthermore, positive changes
66 (i.e., reduction of technical practices, direct management, feedback and convergent
67 questioning; increase of total questioning) were reported although might not exclusively
68 relate to the intervention due to the multiple variables surrounding applied coaching
69 environments and 'out of practice' activities coaches engage in on a daily basis. Hence,
70 it is suggested that in-club visits from independent coach developers empowering and
71 caring for learners might be more appropriate for developing coaches.

72 Most systematic observations of youth football coaches[18,19] and CDPs[17] have been
73 delivered within pitch-based scenarios. Although contemporary learning frameworks
74 (i.e., ecological dynamics, skill acquisition, and constructivist learning theory) advocate
75 for less prescriptive approaches,[20,21,22] studies have continually identified coaches'
76 frequent use of 'instruction' and 'feedback'.[23,24,25] Video-based feedback (VBF) sessions
77 have typically been studied qualitatively to understand perceptions of factors influencing
78 its delivery,[26,27] with a growing preference for balanced positive and negative sequences

of video,[26] active participation of players[28] and cautious use of individual feedback.[29] Only one study has systematically observed team-based VBF sessions at a youth academy with coaches most utilized behavior being feedback[25], and no examples were identified of studies that have attempted to develop coaches in the delivery of post-match VBF sessions. Therefore, combining objective and subjective data[30], the current study aimed to investigate changes in coaches' knowledge and understanding during a longitudinal CDP, developed and delivered by a sport pedagogue researcher-practitioner.

Method

Research context

This study was conducted at the academy of a club competing at the Spanish La Liga 123. The academy comprised eleven teams (under 9 to under 19) all playing in competitive leagues. The Academy Manager and Head of Methodology were responsible for the development of coaches and the coaching curriculum, which did not include content regarding VBF sessions. They identified coach communication as an important developmental area amongst their coaches and welcomed a sport pedagogue (henceforth referred to as A1) and research team in assisting the club.

To encourage coaches to embrace this new department, the sport pedagogue was invited to several events and meetings and was introduced to all academy staff, with reference to his experience working at other European academies. The Academy Manager continually highlighted the importance of communication in coaching and the CDP actions A1 would be undertaking. It was emphasized that all interactions between participants and the sport pedagogue would be confidential.

Participants

Three male Spanish football coaches consented to participate. The under 15 coach withdrew, expressing difficulties in communicating whilst being recorded. This coach's team had experienced a poor run of form and faced relegation; something that within the Spanish academy system would have been detrimental to the who academy. As a result, only two coaches participated in this study. Both Pedro and Juan (pseudonyms), who worked with the under 9 and 13 age-groups, completed the full CDP. Their pen pictures are presented below (Table 1).

Table 1. Coaches´ profiles, qualifications and experience.

Name (Pseudonym)	Pedro	Juan
Age	23	36
Age-group coached year 1	Under 9 Lead	Under 13 Lead
Age-group coached year 2	Under 10 Lead	Under 19´s Assistant
Highest coaching qualification	UEFA A License	UEFA Pro License
Highest level of education	BSc Sport Sciences	A Levels Equivalent
No. of years playing professionally	0	15
No. of years coaching experience	6	3
No. of years coaching youth	6	3
No. of years' delivering video-feedback	1	1
On-going relevant CPD during year 1*	0	0
On-going relevant CPD during year 2*	2	0

* During year 2, only Pedro undertook education (PGCE in PE and a performance analysis course).

Procedure

Prior to data collection, ethical approval was received from a university ethics committee; coaches were informed about the purpose of the study and provided signed informed consent before the study commenced.

All competitive fixtures were filmed by volunteers, and coaches prepared VBF to be delivered in the dressing room before the subsequent training session. The sport pedagogue took field notes after each session that enabled engagement in reflective and reflexive dialogue[31] with the research team.

Coaches in this small-scale, in-depth case study CDP were purposively sampled based on 1) their limited experience delivering VBF sessions, 2) plenty opportunities for

observation, and 3) the AMT's perceived positive attitude towards their development. The CDP, and associated data collection, occurred in several stages: 1) Systematic observations (Sep-Dec 2018); 2) debrief (Jan 2019); 3) workshop and directed task (Mar 2019); 4) directed task two and reflective interview (Apr/May 2019); and 5) consolidation interview (Apr 2020).

Data collection and analysis

Systematic Observations

The lead coach and players met in the changing room up to three days after the previous game and delivered VBF sessions with post-match purposes. Twelve sessions were filmed using a digital video camera (Sony HDR-CX900E, China) mounted on a tripod, and ensuring the projector screen and all players were visible. The first session for each coach was used to familiarize coaches and players[32] and was omitted from final analyses. Each coach was then filmed over an 11-week period (1st of October to 17th of December 2018), with a total of ten post-match team-based VBF sessions analyzed. Thus, five sessions for each coach (average duration: Pedro, 11.33 ± 2.60 minutes; and Juan, 25.13 ± 4.79 minutes) were used to define coaches' baseline behaviors.

As there are no validated systematic observation tools to analyze coach behavior within this context, we followed procedures adopted elsewhere[25]. To ensure appropriateness of the instrument for this specific study, continuous consultation occurred between A1 and the research team. A familiarization session for each coach was pilot coded to explore the coaches' behaviors using the modified instrument. This enabled the research team to identify the behaviors across each session prior to inclusion/exclusion from the final behavior categories (Table 2).

Table 2. Definitions of coach behaviours during post-match VBF sessions.

Behaviour	Description
Positive feedback	Supportive verbal statements or gestures provided by the coach to show his satisfaction with player/s´ performance, e.g., 'That´s brilliant, that´s exactly what I wanted', 'Great turn, Scott'.
Negative feedback	Unsupportive verbal statements or gestures provided by the coach to show his dissatisfaction with player/s´ performance, e.g., 'That wasn´t good enough', 'You aren´t getting in the half turn'.
Corrective feedback	Corrective verbal statements provided by the coach that contain information specifically intending to change/improve the player(s) performance in future similar situations, e.g., 'Try to get wider next time', 'You probably don´t want to be levelled with the wide player'.
Silence	Coach is visibly engaged observing the game in the video in silent or performing other different action such as waiting for a player's response, standing, walking.
Convergent questioning	Limited number of correct answers/options – closed responses, e.g., 'What is the right thing to do in this situation dribbling or passing?', 'Who´s the free man?'.
Divergent questioning	Multiple responses/options – open to various responses, e.g., 'What would you do in this situation?', 'Tell me what you think you need to get better at', 'What else could you have done?'.
Player participation	A player actively verbalizes or demonstrates the right or wrong decision or execution of a skill, technique, movement, positioning, etc. at any given point of the session.
Positive & negative reinforcement	General statements agreeing or disagreeing with the intervention or response/s provided by one or more players, e.g., Positive: 'Exactly', 'Liked that'. Negative: 'No', 'I don´t agree with that', 'Not sure about that'.
Cueing convergent	Verbal cues or prompts with limited options directing players´ attention to a sequence of footage without showing support/dissatisfaction with the player/s´ performance, e.g., 'Martin's driving in to commit the defender', 'He is between the two center backs'.
Cueing divergent	Verbal cues or prompts with unlimited options that direct players´ attention to a sequence of footage without showing support or dissatisfaction with the player/s´ performance, e.g., 'Look what he's doing', 'Look at his movement'.
Management direct	Management that contributes to organizing turns allocations and the sessions´ structure, content or information presented, e.g., 'Let´s see Paul´s thoughts', 'I want you to get in threes', 'Today's aim is transitioning'.
Management indirect	Management that contributes to organizing the technical equipment, e.g., 'See if this wants to work', 'Pause it there', 'Has anyone seen the clicker?'.
Management criticism	Management that demonstrates displeasure at the player(s) behavior during the session, e.g., 'Stop talking, Kevin', Keenan, it´s the third time I´ve got to stop the session', 'You´re late again'.
Humour	Jokes or content designed to make players laugh or smile, e.g., 'Have you eaten a steak for lunch?', 'Brilliant pass' (irony).
Punishment	Specific punishment following a mistake or for disruptive behavior, e.g., "Get out".
Uncodable	Any other behavior not fitting any of the previous categories.

All sessions were coded with Sportscode© Gamebreaker (version 10) and exported to Microsoft Excel 2010. This generated a frequency count and duration for every behavior within each session. Mean frequency count and percentage time were calculated by dividing the sum of every behavior's count within each session by the five sessions delivered by each coach. Duration data were converted into seconds, and mean durations for every behavior were calculated dividing the sum duration of every behavior

158 by the five sessions. Mean percentage times were calculated dividing the mean duration
159 of each independent behavior by the sum duration of behaviors and multiplied by 100.
160 Intra- and inter-observer reliability for frequency data were calculated with the
161 formula (agreements/ agreements + disagreements) x 100. Duration data were converted
162 into seconds before utilizing the formula. Intra-observer reliability was checked by A1
163 who coded the same session twice after bouts of five sessions. Verification achieved 92%
164 and 90% agreement for frequency and duration data, respectively. Inter-observer
165 reliability was calculated comparing A1 and a trained observer's same session codes.
166 Agreement achieved was 88% and 87% for frequency and duration data, respectively.
167 Both reliability checks obtained lower scores (between 2 and 11%) than the achieved by
168 Ford et al[24], but still exceeded the accepted 85% reliability threshold.[33]
169
170 *Debrief*
171 Debrief interviews were conducted with participants to explore their thoughts and
172 experiences of their sessions without knowing their behavioral profiles. These were
173 intended to elucidate Pedro and Juan's beliefs, knowledge, and understanding on the
174 influence of coach behaviors on player learning and development. In particular, we were
175 keen to examine their use of questioning and silence as pedagogical tools in this specific
176 context and how this might transfer into training sessions (Table 3). These behaviors have
177 been highlighted for facilitating players' cognitive engagement[24,25].
178 Table 3. Debrief interview questions.

Behavior	Number	Interview questions
Feedback	1	What type of feedback do you normally give during your post-match VBF sessions?
	2	Would you provide individual negative feedback within a group session? If yes, under which circumstances?
Questioning	3	What type of questions do you normally use during your post-match VBF sessions?
	4	What would you do if players cannot answer a particular question?
	5	Do your questions differ during training compared to VBF sessions? If yes, how are they different?

Silence	6	When does silence can be used to facilitate players' learning during your post-match VBF sessions?

Workshop & directed task

On the 4th of March 2019, both coaches attended a workshop within an office in the club's training ground, where research findings applied to coaching were presented. This was prepared between A1 and the Academy Management Team and leaded by A1 who encouraged frequent input from coaches about the specific aspects addressed. The Head of Methodology was present during the entire 50-minute workshop and assisted A1 by asking him questions regarding the theoretical frameworks presented or emphasizing A1 points. Both A1 and the Head of Methodology remained neutral without providing practical guidelines regarding how to behave during post-match VBF sessions.

Firstly, the workshop introduced the behaviors observed during the post-match VBF sessions and presented the ideas from Williams and Hodges,[21] regarding the utility of prescriptive frequent and immediate feedback, compared to reduced and delayed feedback, whilst exploring additional contributory factors (i.e., bandwidth feedback and questioning). Questioning was then discussed as a behavior for stimulating implicit learning and linked to the use of silence for enabling players thinking and answering.[34] Likewise, convergent and divergent questions were defined as questions restricting or broadening the possible response options,[35] without suggestion of which one is more beneficial or when to adopt them within VBF sessions. The workshop concluded by asking coaches to consider when, where, and how they incorporated questions into their feedback process during VBF. Coaches then delivered two VBF sessions after the workshop which provided an opportunity for implementing ideas.

Directed task 2 & reflective interview

Coaches were given a breakdown of their behaviors three days before the reflective interview. To facilitate that coaches could identify consistencies or inconsistencies between their actual and desired behaviors, previous self-reflection on their data was allowed. The reflective interview schedule explored: 1) recall of behaviors and its definitions; 2) biographical and demographic questions; 3) coaches' perceptions of their behavioral data; 4) questions examining the alignment between current and desired behaviors; and 5) questions to ascertain their intended behaviors' organization within particular clips. If required, video clip examples (i.e., stimulated recall) were shown, followed by a general open question and a subsequent question aiming that coaches rationalized their actions.[36]

Consolidation interview

After reflective interviews, there was no contact with the coaches regarding their VBF sessions. The second season, coaches were encouraged to implement what they had learnt within their new contexts (see table 1 for group and role details). To determine the extent to which participants' knowledge and understanding had stabilized and changed, a final consolidation interview was conducted with each coach.

Debrief, reflective, and consolidation interviews of coaches averaged 21 minutes 24 seconds ± 1.37, 44 minutes 20.5 seconds ± 5.5, and 70 minutes 25.5 seconds ± 2.9; and yielded 6, 16 and 23 single-line-spaced pages of text, respectively. Interviews were transcribed verbatim and A1 read transcripts several times during the analysis phase to ensure familiarity with the data.[37] In-depth analysis was conducted using thematic analysis procedures.[38] This process started deductively with inspection of the predetermined themes followed by line-by-line examination of each transcript to identify further emerging themes.[39] To consider changes between interviews, a matrix of concepts

228 was generated that included initial concepts, categories, and subcategories. Concepts
229 were deemed to have been modified when qualitatively different or more frequently
230 used.[40] Rigor in the process was maintained through frequent discussions amongst the
231 research team who critiqued the analytic decisions of A1 until agreement on thematic
232 structure, names, descriptions, and meaning of themes was achieved (Figure 1).

First order themes	Higher order themes
Positive vs negative feedback Corrective feedback: concept & rationale Corrective vs negative feedback Corrective feedback within positive clips	Feedback
Questioning & player participation: rationales Questioning types influence player participation Re-questioning: rationale	Questioning & player participation
Timing During clip display: observation After questioning: player thinking	Silence
Initial opinion on data Opinion on questioning & player participation Organisation of behaviors Actual vs desired behaviors	Behavior acceptance or rejection

Figure 1. Higher and first order themes of reflective and consolidation interviews.

233

234 ***Results, findings and discussion***

235 ***Phase 1: Systematic observation & debrief***

236 Systematic observations and debrief suggested varied initial patterns of behavior
237 (table 4) and levels of knowledge and awareness during coaches' VBF sessions.

Table 4. Mean % time and frequency count (FC) of coach behaviour during post-match VBF.

Name (Pseudonym)	Pedro		Juan	
	Mean % Time	Mean FC	Mean % Time	Mean FC
Feedback	**22.6**	**18.4**	**53.2**	**98.4**
Positive feedback	8.6	9	13.7	28.2
Negative feedback	2.3	1.8	14.1	29.6
Corrective feedback	11.7	7.6	25.4	40.6
Questioning	**11**	**28**	**5.9**	**28.2**
Convergent questioning	5.1	13	4.1	21.8
Divergent questioning	5.9	15	1.8	6.4
Silence	**17.9**	**33**	**9.9**	**60.8**
Player participation	**19.9**	**45**	**5.4**	**29.2**
Positive reinforcement	4.8	12	0.6	5.2
Negative reinforcement	0.6	2	0.2	1.2
Cueing convergent	5.2	7.6	11.2	33.6
Cueing divergent	1.3	2.4	1	7.2
Management direct	13	28.6	7.8	28
Management indirect	0.1	0.6	0.2	0.2
Management criticism	1.6	1.8	2.5	5.6
Humour	1.1	1.6	1.2	0.8
Uncodable	1	1.4	1	1

*Behaviors in bold and their subcategories are focus of the discussion.

Pedro's most employed behavior was 'feedback'; normally positive, though corrective statements lasted longer. These were interspersed with shorter bouts of silence and a marginally greater number of divergent questions; which might suggest why players contributed to discussion for almost the same amount of time that Pedro provided feedback. Furthermore, qualitative data reflected Pedro's intention to use as much positive feedback as possible, and his preference for open questioning as a mechanism to extend the response options, and to encourage player engagement in higher-order thinking. However, he seemed unsure about how and why his questioning was more convergent during training compared to during VBF sessions. Moreover, Pedro used silence for 17.9 % of the session, though he was not conscious of why and when he was being silent:

Pedro: "*... I think during training I do more closed questions compared to video sessions.*

A1: *Why do you think you do that?*

Pedro: *Eh…good question* [smiling]*…It's a different coach's attitude. The video is more relaxed and the other* [training] *you want to rise up the tempo. So that there aren't many stops and maybe you give more direct feedback.*

A1: *When does it make sense being silent within video sessions?*

Pedro: *I have never thought about that…I believe silence doesn't make sense within a video session. You are showing something and if you don't give any feedback or if they answer and you don't tell them anything, it doesn't make sense".*

In contrast, Juan spent 53.2 % of the VBF session providing feedback, with almost half (25.4 %) being corrective. He demonstrated frequent, but short, spells of silence and a dominant use of convergent questions, that appeared to facilitate limited player participation. In his debrief interview Juan's awareness of utilizing these behaviors was ascribed this to his players adapting to a new game format. Conversely, when asked about his use of questioning types alongside his silence, he demonstrated a lack of awareness of his observed behaviors:

> *"I use more open questions, I think…It's trying to get them to see and assess the possibilities or choose other options such as the other side, switch it, turn, etcetera. I would try more open, to see if they're able to interpret the different options they have in that play…During video sessions, I don't normally do silence. I always try to explain with images a little bit more. As I have the opportunity to show and they watch themselves on video, I prefer not to…".*

Further, when asked about his approach when players could not answer a particular question, he suggested:

> *"If it's an open question, I would directly tell them the different options…because perhaps there are situations they cannot interpret, and I can".*

Studies concerned with VBF have tended to be qualitative,[26,27] and have not focused on the effects that specific coach behaviors have upon players. While individual VBF sessions include more positive feedback than negative,[41] data from this study highlighted preferences toward positive and corrective feedback approaches. Previous studies have found that combinations of negative and corrective feedback can facilitate learners' correction of errors when their task performance is not appropriate.[42] Thus, VBF

sessions have the opportunity to enhance players' confidence[26] whilst also identifying areas for further development. However, a recipient's openness to receive feedback in front of their peers should be considered, especially if highlighting specific improvable aspects of the game.[29]

Coach questioning practices have, typically, been shown to stimulate players' low order thinking, and often answered by the coach.[18,34] Divergent questions are suggested to encourage individuals to engage in higher order thinking and, thus, generate more sophisticated responses and new knowledge.[35] Pedro exhibited a tendency toward divergent questions, whereas Juan demonstrated higher propensity for convergent questioning. Interestingly, in a similar study Raya-Castellano et al.,[25] found that all coaches utilized greater convergent questions. However, Mason, Farrow and Hattie[41] reported higher levels of divergent questioning being employed by elite Australian Football coaches during individual post-match VBF sessions, though this might be attributable to the age and phase of development differences between the two samples.

In this study, coaches' actual and desired feedback were in agreement, though participants demonstrated limited knowledge and awareness surrounding their use of questioning or silence. This supports the epistemological gap reported in literature between behavior and underpinning knowledge.[43] In Juan's case, there appeared to be a difference between his ideas of what, when, and how to use questioning and his actual use of questioning.[15] Furthermore, both coaches were not aware of why they chose to be silent when they did during their VBF sessions. This might reflect their limited experience delivering VBF sessions, or a broader lack of understanding around pedagogic principles.

Phase 2: Reflective interview

Feedback

Pedro maintained his preference for being positive to avoid potential negative influence upon player confidence, although he also explained that this depended on players' previous performance and the difficulty of the upcoming fixture. In addition, he believed corrective feedback was more effective than negative feedback and this could be used either within positive or negative clips:

> *"I think the corrective…is the most useful because you're providing the boy with solutions to his problems… and even to things they do well, you're giving them a wider variety of alternatives. As an example, he has done well because he got passed a rival, but within another game, he had a teammate, and the defender is gonna be better. He´s gonna continue trying dribbling and he's not gonna win the duel. And maybe he could have done a 2 v 1. So he knows he has other alternatives".*

Juan was appreciative of his balanced positive and negative feedback and appeared more considered in the use of the latter not being as constructive as corrective feedback:

> "*…I don´t like dedicating much to this is wrong, don´t do that, no. I´d tell him that the best option was the other. I wouldn't tell him not to do it…I prefer showing him another alternative that I think is better... That without emphasizing whether is good or bad".*

A balance between positive and negative sequences has been proposed to avoid deteriorating players' confidence.[44] Participants suggested that inclusion of corrective feedback can manipulate the message provided by a positive or negative video clip and feedback. For both coaches, corrective feedback was more constructive than negative feedback. Pedro suggested that this could be used within positive or negative clips to either propose further alternatives or make corrections. Nonetheless, it is yet to be examined the extent to which players develop their knowledge and/or retain feedback when receiving different combinations of game sequences and feedback. Only Mason et al[41] have examined player recall of coaches' feedback one week after an individual post-

match VBF session and there is a dearth of quasi-experimental studies in this area. Therefore, providing alternatives to positive and negative game situations might expand players' knowledge, though consideration must be given to the time and type of information, ensuring it is congruent with their learning and playing ability.

Silence

Coaches have previously shown lack of understanding of their silence during training.[18,43] However, long periods of silence used deliberately can empower players to engage in the problem-solving process.[19] After this CDP, Pedro demonstrated increased awareness in his use of silence and outlined two main instances within his VBF sessions where he did so for the benefit of players. He expressed the rationale for silence after questioning but doubted if his silence while players observed clips was the most effective approach for maintaining under nine players' concentration on the footage:

> *"Regarding silence after my questions, you've got to leave them to be protagonist. So, they get to the solution and are able to see, in that play, what is happening...Perhaps, while we're watching the video, I've got to give less silence because it´s twenty seconds. So none gets distracted, to keep their attention…in the play, in what is happening".*

Similarly, contradictions between his actual and desired silence values seemed to be encouraging Juan to explore his strategical use of this behavior to fulfil his session objectives. Apart from being more aware of its application, he contemplated silence as an alternative to maintain concentration on the footage with a potential question to be answered after:

> *"…maybe I should use* [silence] *a bit more…Telling them to watch this play or watch these three plays and after we'll discuss them…I think seeing that I am gonna ask them a question…I think that it helps focus their concentration more and so they see where they might have failed".*

Juan presented more periods of silence, though these accounted for a smaller total percentage duration compared to Pedro (table 4). To maintain player observation of the clips; Juan was considering longer silences prior to questions, whereas Pedro seemed willing to reduce his silence as an alternative. This could be due to the attention span and cognitive capacity of the under nine's, which might be a factor influencing the delivery of VBF sessions.[27]

Further, at this stage only Pedro was conscious of silence after questions being important to allow players to think and answer. In their analysis of coach questioning practices during training sessions, Cope et al[34] found no more than two seconds of post-question silence and after these frames, responses were provided by the coach. Therefore, future studies specific to the VBF context could monitor coaches' silences after their questions and/or the impact that shorter and larger silences might have on the quality of learners' cognitions, responses and knowledge development.

Questioning and player participation

Pedro proposed questioning as a potential tool for encouraging his under nine´s player thinking, curiosity, and participation. When shown a sequence of his sessions where he was re-questioning a player's response with a second question, he stated:

Pedro: "*It´s the same question, isn't? Don´t know what I´d be thinking…but maybe I have formulated the question and that´s why he has answered to something I didn´t want him to respond. Then, I formulate it* [the question] *again differently.*

A1: *What is your objective for doing this?*

Pedro: *In order to get into what I want them to see in the video. To concrete the final response, but that this is given by them.*

A1: *Could the coach give the information after a wrong response from the player?*

Pedro: *Yes, I could but at these ages within these video sessions, I prefer that they get to the result or the solutions instead of me telling them".*

Re-questioning was a potential mechanism to direct players through a mixture of convergent and divergent questions to the coach's desired response options:

> *"Regarding convergent and divergent, as age increases, maybe the divergent need to increase and convergent decrease. With my group, maybe I need to guide them myself with more concrete questions".*

Juan also believed questioning and player participation were useful for encouraging players' autonomous thinking. When players were unable to answer a question, a second question could be formulated to ensure the players generated the response. Additionally, Juan was able to define the concepts of convergent and divergent questioning, but unable to articulate how to combine them within sessions. When shown a session clip, he described his approach of stopping the footage and divergently asking players to explore the existing alternatives at that instance.

> *"…I would try to turn it around to simplify a bit the response or if I see they're not able to* [respond]*; trying to turn it around to see if from other side, they find the solution and not give it myself straight away. Obviously, if there isn't a way for them to get the response, then maybe I tell them, but I would ask it differently first…Perhaps, before the action happens, stop the play and ask the player involved the options he sees. With the convergent, …it's much simpler for them to answer if I stop the clip".*

Further, when asked about his player participation scores, Juan linked them to his higher use of convergent questions requiring short answers:

> *"Most times they've got to speak is to say yes or no, outside…I imagine the level of participation is lower due to them not having to develop. They aren't questions like if he came what would you do? No, it's simply, who's the free man?"*

Both coaches expressed their desire to use divergent questions to enable players' discovering and generating responses during their post-match VBF sessions. However, Juan's data reflects greater use of convergent questioning that he linked to his reduced

player participation. Furthermore, coaches declared that combinations of questions could be used to tease out their own desired responses from the players, which suggest that they positioned themselves as knowledge gatekeepers.[45] Questions can be probing, stimulating the recall of knowledge and the development of new understandings; or guiding, which can direct players towards responses.[46] Open-ended questions combined with VBF have been shown to develop greater tactical knowledge (i.e., number of self-regulatory concepts and a more sophisticated concept structure) for youth players in an experimental group compared to a control group.[47] When not well formulated or cueing the desired response, questions might encourage players' convergent thinking, which constraints the exploration of further possibilities of response not predetermined by the coach. This is not to say that coaches should avoid the use of convergent questions. As Pedro suggested, if players do not possess sufficient knowledge to answer a divergent question, a more convergent question could reduce the challenge initially posed. Thus, divergent and convergent questions might be combined to encourage players to generate answers; drawing on existing knowledge whilst enabling new knowledge development.

Behavior acceptance or rejection

Coaches described the same order in which they planned to sequence their behaviors to favor players' learning. This consisted of silence for player observation being ensued by a divergent question, player participation and coach feedback or a convergent question if player responses had not concreted the coach's pursued response. When asked about his opinion on his current data and whether he was willing to make any future behavior modifications, Pedro indicated:

> *"...I believe the percentages that came up are not bad because the boy takes part enough...The more the player participates, the better. Because I do a good number of divergent and I use convergent when the boys don't respond to what I am looking for.".*

In contrast, Juan was rejecting his delivery and aimed to increase his silence, player participation and re-arranging the order in which his behaviors occurred during particular clips:

> *"Thinking what I said about silence, it seems to me a very good idea…telling them to watch in silence. They would concentrate more and think about the options. But here* [feedback]*, I would have to reduce the time compared to what I wished…First that they become aware whether what they've done is wrong or what other options they had. It would have to come out from them. And afterwards, I can reinforce what they've said".*

Reflection on their own behavior data provoked different responses for coaches. Pedro was satisfied with his behavior profile, whereas Juan had found behavioral 'disturbances'[14] that contradicted his desired behaviors. Because of these discoveries, he was planning to reduce his feedback and redistribute the sequence of behaviors within clips.[48] Therefore, behavioral statistics from coaches' post-match VBF either confirmed or encouraged changes to their desired delivery approach and can be employed with monitoring purposes so coaches self-assess the alignment between their intentions and actual behaviors.

This CDP comprised a workshop and two directed tasks intending to stimulate reflection about coaches' previous sessions and how they might implement content from the workshop within their post-match VBF. This appeared to assist coaches in deciding how to approach future sessions and determine clear expectations that their sessions should include that are better tailored to player benefit. Nevertheless, the mixed-method design of this study does not demonstrate causality between the CDP activities employed (i.e., workshop and directed tasks) and the outcomes achieved in terms of coaches' knowledge development.

Phase 3: Consolidation interview

Pedro

His knowledge seemed stabilized eleven months after the reflective interview took place with minor changes in the meaning of a few themes. When asked about his behavior profile, he maintained his satisfaction, albeit showed a will to reduce negative feedback even more due to its disadvantages for players. Moreover, Pedro was considering the player as an active cognitive agent much more. Although he seemed willing to interrupt silence with cues, so players concentrated on the footage at the reflective interview; he was now more conscious of enabling players' observing the game without directing players' attention to certain aspects:

> *"I think you don't have to give negative. Use corrective instead. Because maybe in this game it doesn't work but it might do it in the following game. If from such an early age you constrain them, they will play with fear to do. Therefore, you've got to try they don't feel the pressure of I'm not doing this because he said that is bad".*
>
> "*During the clip, because I don't want to condition them on that particular player. I wanted them to be self-sufficient and focus on what they thought".*

Similarly, when asked about re-questioning, Pedro was now intending to explore player comments that differed to his clip's objective, if these 'fitted' his understanding:

> *"...what do you see in this play? The boys see things that you hadn't seen. If I see it's interesting, I guide them and explore where do we get with their responses and my questions…But if they answer useless responses for their learning, I use more convergent to facilitate and guide them to what I was looking for within that clip".*

Juan

Comparisons between Juan's reflective and consolidation interviews revealed very little changes in themes' meaning. Juan maintained his belief of divergent questioning facilitating player thinking and proposed planning starting divergent

questions for clips to avoid improvisation. Moreover, he seemed more aware of the difficulties under thirteen players could have generating elaborated responses in front of teammates and had decided further options if players were unable to answer a question:

> Juan: "*…at these ages, although questions are divergent, the boys don´t always reason enough or are too shy many times. A question that requires a longer response, they shorten it a lot…It´s difficult.*
>
> A1: *What could you do to overcome this difficulty?*
>
> Juan: *…Maybe continue asking questions towards where I want to get. Try to guide them with two or three more convergent questions to where I want to get…or even the participation of a third player to encourage him to take part or to see if they get into any kind of agreement".*

Finally, opposed to the reflective phase, Juan had found alternative approaches to combine divergent and convergent questions during his VBF sessions:

> *"Perhaps asking the options he has at that instance and once he has seen the clip, asking a convergent where he gives his opinion on whether is right or wrong and propose other alternatives… there are questions that need more thinking. Often what you want is right, you´ve given me the response, but now I want you to identify the why. So they think a little bit more".*

Coaches' knowledge seemed stabilized and enhanced from reflective to consolidation interview. Stodter and Cushion[49] argue that realistic opportunities are required to transfer new knowledge into behaviors within their contexts because concepts are linked to the situations where they are learnt. Thereby, it could be argued that coaches' knowledge settled after eleven months of no contact with A1 and the Academy Management Team due to having reflected and attempted to implement knowledge within their particular post-match VBF sessions. Hence, CDPs focused on a particular situation-specific coaching task involving self-reflection and application of CDP content might aid coaches to consolidate their knowledge in the medium term. Nevertheless, future quasi-experimental studies could corroborate this assumption.

Limitations

While this research extends literature in the areas of coach behaviour and coach education, it also presented some limitations. Firstly, it is difficult to establish causal relationships between the CDP activities and their impact on coaches, because of the absence of a control group not undertaking any education. Moreover, the quality of coaches' reflection during the second directed task could have been enhanced by incorporating players' anonymous perceptions about their coaches' delivery.

Conclusion

This bespoke longitudinal work-based CDP constitutes an in-depth exploration of changes in knowledge and understanding achieved by two coaches with varied backgrounds[50] and working with different age-groups. Their varied baseline levels of knowledge appeared to increase and stabilize as the CDP progressed. In addition, this study extends our understanding of the delivery of VBF in junior-elite football and how behaviours can be utilised to fulfil the post-match session objectives.

This research also provides various practical considerations for coaches and coach development practice. In particular, a broad framework for structuring a long-term approach to developing coaches, in relation to a specific issue to bring about positive change in coaches' practice. Indeed, coaches in this study appeared to develop knowledge and awareness during the CDP; particularly due to the clear opportunities to implement ideas and reflect on their delivery. The examination of behavior data either reinforced coaches' delivery or enhanced their willingness to change. This suggests that a bespoke CDP, comprising multiple learning mechanisms and integrated opportunities for

559 reflection; delivered and supported longitudinally can be an effective approach for coach
560 development in an applied football environment.

561 **References**

562 1. Allison W, Abraham A and Cale A. *Advances in coach education and development:*
563 *From research to practice*. London: Routledge, 2016.
564 2. Lyle J and Cushion CJ. *Sports coaching concepts: A framework for coaches´ practice*.
565 Oxon: Routledge, 2017.
566 3. Colley H, Hodkinson P and Malcolm J. *Informality and formality in learning: A*
567 *report for the learning Skills Research Centre*. London: Learning and Skills Research
568 Centre, 2003.
569 4. Cushion CJ and Nelson L. Coach education and learning: developing the field. In: P
570 Potrac, W Gilbert and J Denison (eds) *Routledge handbook of sports coaching*. Oxon:
571 Routledge, 2013, pp. 359-374.
572 5. Mesquita I, Ribeiro J, Santos S, et al. Coach learning and coach education: Portuguese
573 expert coaches´ perspective. *Sport Psychol* 2014; 28*:* 124-136.
574 6. Stodter A and Cushion CJ. Evidencing the impact of coaches´ learning: changes in
575 coaching knowledge and practice over time. *J Sports Sci* 2019; 2086-2093. Available
576 from: https://doi.org/10.1080/02640414.2019.1621045
577 7. Nelson LJ and Cushion CJ. Reflection in coach education: The case of the national
578 governing body coaching certificate. *Sport psychol* 2006; 20*:* 174-183.
579 8. Cushion JC, Griffiths M and Armour K. Professional coach educator in-situ: a social
580 analysis of practice. *Sport Educ Soc* 2017; 533-546. Available from:
581 https://doi.org/10.1080/13573322.2017.1411795
582 9. Stodter A and Cushion CJ. Coaches´ learning and education: a case study of cultures
583 in conflict. *Sports Coach Rev* 2014; 3*:* 63-79.

584 10. Gilbert W and Trudel P. Learning to coach through experience: Reflection in model
585 youth sport coaches. *J Teach Phys Educ* 2001; 21: 16-34.
586 11. Cushion CJ. Reflection and reflective practice discourses in coaching: a critical
587 analysis. *Sport Educ Soc* 2016; 82-94. Available from:
588 https://doi.org/10.1080/13573322.2016.1142961
589 12. Partington M, Cushion CJ, Cope E, et al. The impact of video feedback on
590 professional youth football coaches´ reflection and practice behaviour: A longitudinal
591 investigation of behaviour change. *Reflect Pract* 2015; 16: 700–716.
592 13. Wardsworth N, Charnock L, Russell J, et al. Use of video-analysis feedback within a
593 six-month coach education program at a professional football club. *J Sport Psychol*
594 *Action* 2018; 73-91. Available from:
595 https://doi.org/10.1080/21520704.2018.1528324
596 14. Voldby CR and Klein-DΦssing R. "I thought we were supposed to learn how to
597 become better coaches": developing coach education through action research. *Educ*
598 *Action Res* 2019; 534-553. Available from:
599 https://doi.org/10.1080/09650792.2019.1605920
600 15. Argyris C and Schön DA. *Theory in Practice: Increasing professional effectiveness*.
601 San Francisco, CA: Jossey-Bass, 1974.
602 16. Griffiths MA, Armour K and Cushion CJ. Trying to get our message across:
603 Successes and challenges in an evidence-based professional development programme
604 for sport coaches. *Sport Educ Soc* 2016; 283-295. Available from:
605 https://doi.org/10.1080/13573322.2016.1182014
606 17. Cope E, Cushion CJ, Harvey S, et al. Investigating the impact of a Freirean informed
607 coach education programme. *Phys Educ Sport Pedagogy* 2020; 1-14. Available from:
608 https://doi.org/10.1080/17408989.2020.1800619

609 18. Partington M, Cushion CJ and Harvey S. An investigation of the effect of athletes´
610 age on the coaching behaviours of professional top-level youth soccer coaches. *J*
611 *Sports Sci* 2014; 32: 403-414.
612 19. Smith M and Cushion C. An investigation of the in-game behaviours of professional,
613 top-level youth soccer coaches. *J Sports Sci* 2006; 24: 355–366.
614 20. Otte F, Davids K, Millar S, et al. When and how to provide feedback and instructions
615 to athletes? – How Sport Psychology and Pedagogy insights can improve coaching
616 interventions to enhance self-regulation in training. *Front Psychol* 2020; 11: 1-14.
617 21. Williams AM and Hodges NJ. Practice, instruction and skill acquisition in soccer:
618 Challenging tradition. *J Sports Sci* 2005; 23: 637–650.
619 22. Light R. Complex learning theory – Its epistemology and its assumptions about
620 learning: Implications for physical education. *J Teach Phys Educ* 2008; 27: 21–37.
621 23. Partington M and Cushion CJ. Performance during performance: Using Goffman to
622 understand the behaviours of elite youth football coaches during games. *Sports Coach*
623 *Rev* 2012; 1: 93–105.
624 24. Ford P, Yates I and Williams M. An analysis of practice activities and instructional
625 behaviours used by youth soccer coaches during practice: Exploring the link between
626 science and application. *J Sports Sci* 2010; 28*:* 483–495.
627 25. Raya-Castellano PE, Reeves MJ, Littlewood M, et al. An exploratory investigation of
628 junior-elite football coaches' behaviours during video-based feedback sessions. *Int J*
629 *Perform Anal Sport* 2020; 20: 729-746.
630 26. Groom R, Cushion CJ and Nelson L. The delivery of video-based performance
631 analysis by England youth soccer coaches: Towards a grounded theory. *J Appl Sport*
632 *Psychol* 2011; 23: 16–32.

27. Middlemas S and Harwood C. No place to hide: Football players′ and coaches′ perceptions of the psychological factors influencing video feedback. *J Appl Sport Psychol 2018; 30*: 23-44.
28. Wright C, Carling C, Lawlor C, et al. Elite football player engagement with performance analysis. *Int J Perform Anal Sport* 2016; 16: 1007–1032.
29. Nelson L, Potrac P and Groom R. Receiving video-based feedback in elite ice-hockey: A player′s perspective. *Sport Educ Soc* 2014; 19: 19–40.
30. Dugdale JH, Sanders D, Myers T, et al. A case study comparison of objective and subjective evaluation methods of physical qualities in youth soccer players. *J Sports Sci* 2020; 38: 1304-1312. Available from: https://doi.org/10.1080/02640414.2020.1766177
31. Attia M and Edge L. Be(com)ing a reflexive researcher: A developmental approach to research. *Open Rev Educ Res* 2017, 4: 33-45.
32. Darst PW, Zakrajsek DB and Mancini VH. *Analysing physical education and sport instruction* (2nd ed.). Champaign, IL.: Human Kinetics, 1989.
33. van der Mars H. Observer reliability: Issues and procedures. In: P Darst, D Zakrajsek and V Mancini (eds) *Analysing physical education and sport instruction*. Champaign, IL.: Human Kinetics, 1989, pp.53-80.
34. Cope E, Partington M, Cushion, CJ, et al. An investigation of professional top-level youth football coaches′ questioning practice. *Qual Res Sport Exerc Health* 2016; 8: 380-393.
35. Harvey S and Light R. Questioning for learning in game-based approaches to teaching and coaching. *Asia-Pacific J Health Sport Phys Ed* 2015; 6*:* 175–190.

36. Applebee AN, Langer JA, Nystrand M, et al. Discussion-based approaches to developing understanding: classroom instruction and student performance in middle and high school English. *Am Educ Res J* 2003; 40: 685-730.
37. Braun V, Clarke V and Weate P. Using thematic analysis in sport and exercise research. In: B Smith and AC Sparkes (eds) *Routledge handbook of qualitative research in sport and exercise*. Oxon: Routledge, 2016, pp.191-205.
38. Hanton S and Jones G. The acquisition and development of cognitive skills and strategies: I. Making the butterflies fly in formation. *Sport Psychol* 1999; 13: 1-21.
39. Scanlan TK, Ravizza K and Stein, GL. An in-depth study of former elite figure skaters: I. Introduction to the project. *J Sport Exerc Psychol* 1989; 11: 54-64.
40. Saldaña J. *Longitudinal qualitative research: Analysing change through time*. Oxford: Altamira Press, 2003.
41. Mason RJ, Farrow D and Hattie J. An exploratory investigation into the reception of verbal and video feedback provided to players in an Australian Football League club. *Int J Sports Sci Coach* 2020; 1-11. Available from: https://doi.org/10.1177/1747954120951080
42. Tzetzis G, Votsis E and Kourtessis T. The effect of different corrective feedback methods on the outcome and self-confidence of young athletes. *J Sports Sci Med* 2008, 7: 371-378.
43. Partington M and Cushion CJ. An investigation of the practice activities and coaching behaviours of professional top-level youth soccer coaches. *Scand J Med Sci Sport* 2013; 23: 374–382.
44. Groom R and Cushion CJ. Using of video based coaching with players: A case study. *Int J Perform Anal Sport* 2005; 5: 40–46.

680 45. Potrac P and Cassidy T. The Coach as a 'More Capable Other'. In: RL Jones (ed) *The*
681 *Sports Coach as Educator: Re-Conceptualising Sports Coaching.* Oxon: Routledge,
682 2006, pp. 39-50.
683 46. Sahin A. Teachers´ classroom questions. *Sc Sci Math* 2007; 107: 369–370.
684 47. García-González L, Moreno MP, Moreno A, et al. Effectiveness of a video-feedback
685 and questioning programme to develop cognitive expertise in sport. *PloS One* 2013,
686 8: e82270-12. Available from: https://doi.org/10.1371/journal.pone.0082270
687 48. Jarvis P. *Learning to be a person in society*. Oxon: Routledge, 2009.
688 49. Stodter A and Cushion C. What works in coach learning, how and for whom? A
689 grounded process of soccer coaches' professional learning. *Qual Res Sport Exerc*
690 *Health* 2017; 9: 321-338.
691 50. Agustí D, Ballester R, Juan-Blay J, et al. The academic background of youth soccer
692 coaches modulates their behavior during training. *Front Psychol* 2020; 1-11.
693 Available from: https://doi.org/10.3389/fpsyg.2020.582209