**Football coaches’ perceptions of the introduction, delivery and evaluation of visual exploratory activity**

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**Abstract**

The purpose of the study was to examine how visual exploratory activity (VEA) is introduced, delivered, and evaluated by football coaches. Further, this study aimed to explore whether distinct groups of football coaches existed who differed in their approach to the delivery of VEA training and, if so, whether there were differences in the demographics of the coaches across these differentiated groups. The participants in the study consisted of 303 current football coaches who completed an online survey comprised of three sections and 12 items. Cluster analysis identified three clusters of coaches, which were distinguished by the extent to which they engaged in the delivery of VEA training: Low delivery of VEA training (n = 68), Moderate delivery of VEA training (n = 153) and High delivery of VEA training (n = 82). The High delivery of VEA training cluster were likely to provide more feedback/instruction on VEA; they designed an activity or part of a session to focus on VEA more often; and the percentage of sessions they would primarily focus on VEA was higher compared to the Moderate delivery of VEA training and Low delivery of VEA training clusters. It appears that a higher coaching qualification and experience (years coached and number of hours coached per week) leads to a positive attitude of coaching VEA. Future research regarding VEA should involve direct observations of coaching behaviour in relation to VEA, as well as interviewing the coaches on the delivery of VEA training. From a practical perspective, there is a need for further research to explore practice design and how this can be developed to enhance the use of VEA by performers.

Keywords: visual exploratory activity; decision-making; perceptual-cognitive skill; coaching.

**1.** **Introduction**

Successful perceptual-cognitive skill in team-sports such as football requires players to pick up task-relevant information during the control of action in complex and dynamic situations (Araújo, Davids, & Hristovski, 2006; Pocock, Dicks, Chapman, Barker & Thelwell, 2017). At the elite level, football players may only hold possession of the ball 40 to 60 times in an entire match (Dellal et al., 2011) and the average duration of a single possession for outfield players is only 1.1 seconds (Carling, 2010). Thus, the majority of movements when not in possession - to support a team-member, for instance - require that the player reads the game in order to ensure that they act successfully when in possession. Researchers have proposed that an ability to read the game is developed through sport-specific adaptations to perceptual-cognitive skills that include recognising and recalling patterns of play (Williams, Hodges, North, & Barton, 2006), anticipating an opponents’ actions (Williams & Davids, 1998), and showing greater situational awareness (Ward & Williams, 2003).

In the perceptual skills literature, one factor which has been the subject of considerable research is visual search behaviours (Roca, Ford, McRobert, & Williams, 2011; Vaeyens, Lenoir, Williams, & Philippaerts, 2007); that is, the sequence, location and duration of visual fixations by a performer. For example, using video sequences of 11 v 11 scenarios in football, Roca et al. (2011) identified that professional and semi-professional players performed more fixations of shorter duration to more locations in the display compared to amateur players. However, the generalisation of video-based tests of visual search behaviours underpinning perceptual-cognitive skill have been questioned (Dicks, Button, & Davids, 2010; Jordet, 2005a). In a recent study, van Maarseveen, Oudejans, Mann and Savelsbergh (2016) examined the performance of skilled football players on video tests of perceptual-cognitive skill (pattern recognition, decision-making and anticipation) and compared the results of these tests to on-field performance during small-sided games. Results revealed non-significant correlations between the level of performance on the different video-based perceptual-cognitive tests. Analysis of visual search behaviours revealed differences in gaze patterns when participants completed the video test of pattern recall in comparison with the anticipation and decision-making tests, suggesting that pattern recall skill, in particular, may be driven by different processes to those used for anticipation and decision-making. Furthermore, the on-field performance was not predicted by any of the video-based tests, suggesting possible difference between current laboratory and field-based measures of perceptual-cognitive skill that have been used in studies of expert performance (McGuckian, Cole & Pepping, 2018).

The findings considered above indicate that although the research on video-based measures of visual search behaviour and perceptual-cognitive skill has offered insight into the factors which may distinguish less-skilled from skilled footballers (Williams et al., 2011), there may be a need to move towards the development of better on-field measures (Dicks, Button & Davids, 2010; McGuckian et al., 2018). In the sport expertise literature, theoretical perspectives in ecological psychology (Gibson, 1979), which place emphasis on the reciprocal role of perception-action in skilful decision-making (Araújo et al., 2006) and anticipation (van der Kamp et al., 2008), has been used as a framework for recent research (McGuckian et al., 2018). From this perspective, visual search is conceptualised as an active process, which encompasses the body, head and eyes (van der Kamp & Dicks, 2017). Exemplary of such an approach to perceptual expertise, Jordet (2005a, 2005b) proposed that researchers (and coaches) should consider the study of visual exploratory activity (VEA), defined as:

“A body and/or head movement in which the player’s face is actively and temporarily directed away from the ball, seemingly with the intention of looking for teammates, opponents or other environmental objects or events, relevant to perform a subsequent action with the ball” (Jordet, 2005b, p.143).

If VEA is a reliable indicator of a performer’s perceptual skill, then observation of the timing and frequency of a player’s VEA could become an accessible skill development measure for scientists and applied practitioners, particularly for those working within talent development environments (see Pocock et al., 2017). Initial research into VEA examining close-up footage of players during live games indicated a positive relationship between visual exploration frequency and performance with the ball (Jordet, 2008). Specifically, English Premier League midfield players demonstrated higher frequency VEA than a sample of Dutch amateur players. Furthermore, Premier League players who had won international awards demonstrated a higher frequency of VEA than the players who had not won awards and there was a significant positive relationship between the frequency of VEA and pass completion rate (Jordet, Bloomfield, & Heijmerikx, 2013). Subsequent research by Eldridge, Pulling, and Robins (2013) further demonstrated a relationship between the occurrence of VEA and the accuracy of performance in a youth football context. Although VEA appears to be an important indicator of performance accuracy in youth and elite footballers, there is a lack of understanding on how coaching practices can impact upon the development of this aspect of skill (McGuckian et al., 2018; Pocock et al., 2017).

Developing an understanding of current coach knowledge and practice provides the possibility to identify developments and interventions to support the coaching process (Abraham & Collins, 1998). There has been much progress in understanding the knowledge and practices of sports coaches in relation to key principles of biomechanics and skill acquisition (e.g., Smith, Roberts, Wallace, Kong, & Forrester, 2015; Whelan, Kenny, & Harrison, 2016). Specific to the application of skill acquisition in coaching, observation of UEFA A and B Licensed youth football coaches has identified the potential need to bridge the gap between the applied recommendations that stem from research evidence and actual coaching behaviours (Ford, Yates, & Williams, 2010). This research suggested that coaches spent more time developing players in training form (e.g., drill-based coaching with minimal decision making) than playing form (e.g., variable, game-based coaching) practice despite research evidence advocating more support for the latter mode of practice (see also, Partington & Cushion, 2013). O’Connor, Larkin and Williams (2017) found that football coaches generally apply more playing form than training form activities, however, coaches demonstrated high amounts of instruction and tended to ‘over-coach’. This coaching practice has the potential to reduce the problem-solving and decision-making demands on players. An investigation of coach perceptions of youth rugby revealed that many coaches highlighted the need for lots of structure in competitive match-play rather than unstructured youth rugby (Thomas, Coles & Wilson, 2017). However, not all coaches shared this opinion; specifically, elite coaches (Thomas & Wilson, 2014) and youth coaches who had played at a high level (Thomas et al., 2017), supported a less structured youth game, with a coaching emphasis on decision-making and skill development, which is a view commensurate with research evidence (Côté & Abernethy, 2012).

In summary, research has suggested that VEA is an important facet of skilled performance in youth (Eldridge et al., 2013; Pocock et al., 2017) and adult (Jordet et al., 2013) football. However, it is currently unknown whether such evidence is commensurate with the views of coaches and whether coaching practices are utilised to develop VEA in training. Research has revealed differences between the opinions of youth coaches and the type of practices utilised in the development of perceptual skill in team sports (Ford et al., 2010; Thomas & Wilson, 2014; Thomas et al., 2017). In order to further current understanding on VEA and coaching practices, the present study developed an online survey to examine: (i) when VEA should be introduced in coaching; (ii) how VEA is delivered by coaches and (iii) how coaches evaluate VEA. Further, this study aimed to explore whether distinct groups of football coaches existed who differed in their approach to the delivery of VEA training and, if so, whether there were differences in the demographics of the coaches across these differentiated groups.

**2. Method**

*2. 1 Participants*

The participants in the study consisted of 303 current football coaches. Table 1 provides an overview of the demographic details of the coaches.

Table 1. Demographic details of the coaches.

|  |  |
| --- | --- |
|  | Number of coaches |
| Highest qualification obtained |  |
|  No qualification  | 24 |
|  FA Level 1 (first formal level of qualification) | 83 |
|  FA Level 2 | 87 |
|  UEFA B Licence | 70 |
|  UEFA A Licence | 16 |
|  UEFA Pro Licence (highest formal level of qualification) | 1 |
|  Other | 22 |
|  |  |
| Number of years coaching experience (Stoszkowski & Collins, 2016) |  |
|  <1-2 years | 39 |
|  3-5 years | 75 |
|  6-9 years | 67 |
|  10-14 years | 68 |
|  15 years or more | 54 |
|  |  |
| Hours of coaching per week  |  |
|  <1-2 hours | 57 |
|  2-3 hours | 55 |
|  3-5 hours | 75 |
|  5-10 hours | 53 |
|  10 hours or more  | 63 |
|  |  |
| Age group of players the coaches work with (adapted from Partington, Cushion & Harvey, 2014) |  |
|  Under 9 years and below | 57 |
|  Under 10 years and under 11 years | 53 |
|  Under 12 years and under 13 years | 69 |
|  Under 14 years, under 15 years and under 16 years | 68 |
|  16 years and over | 56 |
|  |  |
| Level of players the coaches work with |  |
|  Grassroots/Club/School | 180 |
|  District/Representative team | 21 |
|  Development centre | 30  |
|  Academy | 58 |
|  Semi-professional | 11 |
|  Professional | 3 |

*2.2 Instrument*

The instrument was developed following procedures in existing research (Stoszkowski & Collins, 2016). The four authors, who each have a background in sports coaching, developed an initial survey. As there was limited previous research and coaching literature on VEA, an inductive approach was adopted. A pilot test was conducted on the survey, which involved three qualified football coaches (mean ±SD: age = 23.0 ± 5.2 years); one UEFA B Licence holder with seven years coaching experience and two FA Level 2 coaches each with three years coaching experience) completing the survey and providing comments. The coaches were also interviewed following the pilot test so they could suggest any improvements to the structure, format and wording of the survey. The main adjustment made was the use of the word ‘scanning’ rather than ‘VEA’, as the coaches suggested that this term was more universally known across team sports[[1]](#footnote-1). The final version of the survey comprised of three sections and 12 items. Section one comprised of five questions based on the coaches’ demographics. Questions were related to the coaching qualifications they possessed; their years of coaching experience; the number of hours per week they coached; and, the age group and playing level of the players that the coaches predominantly worked with (see Table 1). Section two provided a definition of VEA (Jordet, 2005b) and a video clip of a youth player performing VEA within a small-sided training game. This section was included so that the participants were aware of how VEA had been defined in the literature to date. Section three comprised of seven questions based on the coaches’ perceptions of VEA. Of the seven questions, three were closed (e.g. On a scale of 0 to 10, how important is it for a player to develop the skill of scanning?); three were closed with the option to provide a reason for the response (e.g. Within your coaching, how often would you give your players instruction/feedback on scanning? Please provide a reason for your response); and one open question was asked (How would you recognise if a player is using scanning effectively?). A copy of the survey is available from the first named author.

*2.3 Procedure*

Prior to data collection, the local institution’s research ethics committee granted ethical approval. An online survey tool (Bristol Online Survey, www.onlinesurveys.ac.uk) hosted the survey. The web link for the survey was distributed to personal contacts of the researchers by email; these contacts included football coaches, FA coach educators, university lecturers, club secretaries, league secretaries and physical education teachers. Social media (Twitter and Facebook) was also used by three of the researchers to distribute the survey. When participants clicked on the web link for the survey, they were presented with a title page, followed by a participant information sheet. The participants were then taken to the next page where they were asked to provide informed consent. The participants completed sections one to three of the survey (as detailed in the instrument section). The survey was active for seven months and three weeks.

*2.4 Data Analysis*

*2.4.1 Qualitative analysis*

The responses to the open-ended questions were subjected to inductive content analysis (Patton, 2015) following a two-step process (Côté, Salmela, Baria, & Russell, 1993). In the first step, meaning units were identified within the responses supplied by coaches, and each meaning unit was coded with a provisional name describing the topic. Each author took primary responsibility for coding one of the questions. Once all answers had been coded, the codes were reviewed and refined for consistency (i.e., each item within a code refers to the same concept) and exclusivity (i.e., no overlap between codes). In the second step, codes with similar meanings were grouped together, and a new label generated which summarised the identity of that group of codes. A collaborative coding process was adopted in both step one and step two of the coding process, whereby one of the authors, who had not been involved in the analysis of that question, reviewed and queried both the initial coding, and the clustering of codes. In order to further enhance the trustworthiness of the analysis, the authors independently familiarised themselves with all of the data by reading through the lists of meaning units. Discussions continued until the research team were satisfied that a workable structure had emerged from the qualitative data collected (Sparkes, 1998).

*2.4.2 Quantitative analysis*

The responses from the closed questions were entered into SPSS v22 and descriptive statistics calculated. As the data was not normally distributed, medians and inter-quartile ranges are reported. Cluster analysis was applied to determine whether groups of football coaches existed who differed in their approach to the delivery of VEA training (Thomas et al., 2017). Cluster analysis allows natural groupings to emerge from the data, and is an appropriate method to adopt when there are no clear theoretical or empirical reasons for grouping coaches (Hair, Anderson, Tatham, & Black, 2010). The first stage of the cluster analysis was to decide which responses from the survey to explore. The responses that were selected for the cluster analysis were chosen in relation to conceptual and practical considerations. The conceptual considerations were that VEA will or will not form part of a coach’s regular practice and that coaches will vary in terms of the frequency that they deliver VEA. The practical consideration was that there were three questions from the survey based on how coaches deliver VEA and therefore the responses to the following three questions were used for the cluster analysis: (i) Within your coaching, how often would you give your players instruction/feedback on VEA?; (ii) Within your coaching, how often would you design an activity or part of a session to develop VEA?; and (iii) Within your coaching, approximately what percentage of sessions would primarily focus on VEA? The responses to questions (i) and (ii) were recorded on a scale from 0 (never) to 10 (very often). The response to question (iii) was a percentage and therefore the response to question (iii) was adjusted to a scale of 0 to 10 before the cluster analysis (Mooi & Sarstedt, 2011).

The responses were examined to assess the impact of multicollinearity and it was judged to be at an acceptable level (correlation coefficients < 0.57) (Hutcheson & Sofroniou, 1999). Hierarchical cluster analysis was conducted using Ward’s agglomerative method with squared Euclidean distance. This method has been previously used for exploring groups of rugby union coaches based on their beliefs and attitudes (Thomas et al., 2017). It has also been suggested that Ward’s agglomerative method is appropriate for ordinal data that has been standardised to a specific range (Everitt, Landau, Leese & Stahl, 2011). The aggolomerative hierarchical technique, as used in this study, ultimately reduced the data to a single cluster containing all the participants, requiring the researchers to decide on the number of clusters present (Everitt et al., 2011). In the current study, cluster analysis indicated two, three and five cluster solutions that warranted further investigation. Examination of the dendrogram, the average within cluster distance, and the descriptive statistics for each cluster, suggested that the three cluster solution was the most promising. In order to ensure rigour, a Professor of statistics, with no knowledge of the study’s aims, independently inspected the data output and concurred with the selection of the three cluster solution. Cluster 1 (C1) had a total of 68 coaches, cluster 2 (C2) contained 153 coaches and cluster 3 (C3) had 82 coaches. The Kruskal-Wallis one-way analysis of variance was utilised to verify the differences between the three clusters. Mann-Whitney U tests were then used to complete the pairwise comparisons. Based on the descriptive statistics, the clusters were classified as; *Low delivery of VEA training* (C1), *Moderate delivery of VEA training* (C2) and *High delivery of VEA training* (C3) to reflect the extent to which coaches implemented VEA in the design and delivery of their sessions.

The three clusters were then investigated with the use of chi-squared tests according to the demographic data (highest qualification obtained; number of years coaching experience; hours of coaching per week; age group of players the coaches work with; and level of players that the coaches work with). When the chi-squared tests were analysed with all possible outcomes, the highest qualification obtained and the level of players the coaches worked with contained cells that had an expected value less than five, thereby violating the assumption underpinning the use of chi-squared tests (see Thomas & Nelson, 1996). To negate this violation, the coaches who had the UEFA A Licence and the UEFA Pro Licence were collapsed into one category. Further, three collapsed categories were also developed for the level of players the coaches worked with: (i) Grassroots/club/school; (ii) District/Representative team and Development centre; and, (iii) Academy, semi-professional and professional. The following associations were then tested statistically using the chi-squared (χ2) test of independence; (i) the highest coaching qualification obtained and the cluster classification; (ii) the number of years coaching experience and the cluster classification; (iii) the amount of hours coached per week and the cluster classification; (iv) the age group of the players that the coach works with and the cluster classification; and, (v) the level of the players that the coach works with and the cluster classification. Cramer’s V was used to calculate the effect sizes. When significant chi-square results with a small effect size were found, standardized residuals (SR) provided a *post-hoc* test to identify where there were significant deviations from the expected frequencies (Hancock, Young, & Ste-Marie, 2011). SRs ≥ ±1.96 were deemed noteworthy.

**3. Results**

*3.1 Confirmation of the cluster analysis classification*

As described in the data analysis section, a cluster analysis was used to determine whether groups of football coaches existed who differed in their approach to the delivery of VEA training. Three clusters emerged, which were distinguished by the extent to which coaches engaged in the delivery of VEA training: Low delivery of VEA training (n = 68), Moderate delivery of VEA training (n = 153) and High delivery of VEA training (n = 82). There was a significant association between the highest coaching qualification obtained and the cluster classification (χ210 = 27.51, p = 0.002, V = 0.213). In the Low delivery of VEA training cluster there was an over-representation of coaches with no qualification (SR = 2.4) or a highest qualification of FA level 1 (SR = 2.4). Within this cluster, there was also an under-representation of coaches whose highest qualification was the UEFA B (SR = -2.4). There was a significant association between the number of years coaching experience and the cluster classification (χ28 = 21.53, p = 0.006, V = 0.188). In the Low delivery of VEA training cluster there was an over-representation of coaches who had been coaching for <1-2 years (SR = 3.5). There was a significant association between the number of hours coached per week and the cluster classification (χ28 = 26.17, p < 0.001, V = 0.208). In the Low delivery of VEA training cluster there was an over-representation of coaches who coach for <1-2 hours per week (SR = 3.7). There was a non-significant association between the age group of the players that the coach worked with and the cluster classification (χ28 = 4.42, p = 0.818, V = 0.085). There was a non-significant association between the level of the players the coach works with and the cluster classification (χ24 = 3.227, p = 0.521, V = 0.073).

The three clusters were significantly different from each other based on how often the coaches gave players instruction/feedback on VEA (H(2) = 82.31, p < 0.001). All of the pairwise comparisons were significantly different: low – moderate (U = -66.94, p < 0.001, r = -0.37); low – high (U = -125.66, p < 0.001, r = -0.74); and moderate – high (U = -58.71, p < 0.001, r = -0.33) (see Figure 1).

INSERT FIGURE 1 ABOUT HERE

Figure 1. Frequencies with which the coaches provided players with instruction/feedback on VEA. Error bars represent median absolute deviation.

The three clusters were significantly different from each other for how often the coaches designed an activity or part of a session to develop VEA (H(2) = 181.42, p < 0.001). The pairwise comparisons were all significantly different: low – moderate (U = -131.86, p < 0.001, r = -0.70); low – high (U = -185.75, p < 0.001, r = -1.07); and moderate – high (U = -53.89, p < 0.001, r = -0.30) (see Figure 2).

INSERT FIGURE 2 ABOUT HERE

Figure 2.Frequencies with which the coaches designed an activity or part of a session to develop VEA. Error bars represent median absolute deviation.

The three clusters were significantly different for the percentage of sessions that the coaches would primarily focus on VEA (H(2) = 194.88, p < 0.001). All of the pairwise comparisons were significantly different: low – moderate (U = -53.38, p = 0.01, r = -0.28); low – high (U = -186.09, p < 0.001, r = -1.07); and moderate – high (U = -132.71, p < 0.001, r = -0.73) (see Figure 3).

INSERT FIGURE 3 ABOUT HERE

Figure 3. Percentage of sessions in which the coaches would predominantly focus on VEA. Error bars represent median absolute deviation.

*3.2 Introducing VEA*

Within all three clusters, coaches predominantly suggested that VEA should be introduced at under 8 years or earlier (Low delivery of VEA training cluster 52% of coaches, Moderate delivery of VEA training cluster 56% of coaches, High delivery of VEA training cluster 66% of coaches). A chi-squared testof independence revealed broad similarity across the clusters, with the exception that coaches in the Low delivery of VEA training cluster (27%; SR = 2.6), who were more likely to introduce VEA at age 11 years or above than coaches in either the Moderate delivery of VEA training cluster (12%) or High delivery of VEA training cluster (10%) (χ24 = 12.727, p = 0.013, V = 0.145). Irrespective of cluster, the primary reason provided by coaches for their choice of when VEA should be introduced was the importance/advantage of starting early (Table 2). The majority of coaches emphasised the need for players to start developing this skill as early as possible, often making a connection to the benefit of forming skills that are "instinctive", for example "It should be embedded as young as possible so it is a natural reaction, just the same as kicking the ball" (P272, High delivery of VEA training cluster). A small number of coaches (n = 11, 3.6% of the total number of coaches) provided reasons for starting early, including the suggestion that players learn more quickly when they are younger, for instance "it is more difficult to teach to players once in their teens" (P33, Moderate delivery of VEA training cluster). A further suggestion was provided that earlier introduction allows for more practice to be accumulated (n = 3, 1.0% of the total number of coaches), for instance "the earlier they become aware of it as a desirable skill, the longer time they have to develop it and the less pressure there will be to develop it quickly" (P191, Moderate delivery of VEA training cluster).

The second theme to emerge related to introducing VEA at an age-appropriate point (Table 2). Differences between the clusters were evident on a single sub-theme only: 15% of coaches in both the Low delivery of VEA training and Moderate delivery of VEA training clusters, compared to only 2% of coaches in the High delivery of VEA training cluster, commented upon the need to master more basic elements (often specified as ball mastery) of the game first, for example "at this age they should have the basic skills to be able to control the ball and position it where they want for the next pass/shot etc. They can then move on to develop this more advanced skill." (P54, Moderate delivery of VEA training cluster). Rather than age, 11 coaches (3.6% of the total number of coaches) made specific reference to a player’s level of skill or willingness to learn as the determining factor when introducing VEA, for instance "if the players you coach are good listeners progressing well teaching them at a younger age can only help in their development to become a rounded footballer" (P85, Moderate delivery of VEA training cluster). Rather than focusing on the individual, 26 coaches (8.6% of the total number coaches) emphasised that the structure of the age-grade game dictated when VEA should be introduced, as an example "scanning is linked to passing and receiving, at U7/U8 the player needs to be aware of 'traffic' so he can receive cleanly and perform the next action" (P45, Moderate delivery of VEA training cluster).

*3.3 Delivery of VEA*

Coaches reported that VEA was delivered using a variety of methods (Table 2). The most common method that coaches reported that they used to deliver VEA was direct instruction (n = 88, 29.0% of the total number of coaches). The use of direct instruction such as “ always saying ‘look up’, ‘check your shoulder’ during training and matches” (P195, Low delivery of VEA training cluster) was more common for coaches within the Low delivery of VEA training cluster (32.4%) and the Moderate delivery of VEA training cluster (32.0%) compared to coaches within the High delivery of VEA training cluster (20.7%). A second method that coaches used to relay information through verbal communication was via questioning (n = 17, 5.6% of the total number of coaches). Coaches from the Moderate delivery of VEA training cluster (7.2%) and High delivery of VEA training cluster (6.1%) were more likely to apply questioning than coaches from the Low delivery of VEA training cluster (1.5%), for instance “I ask questions and provide feedback as to how to improve the effectiveness of their scanning” (P123, Moderate delivery of VEA training cluster). Finally, rather than instructional modes, a common method that coaches reported using to develop VEA was through the modification of task constraints that were designed to encourage the use of VEA (n = 59, 19.5% of the total number of coaches). Coaches from the High delivery of VEA training cluster (23.3%) and Moderate delivery of VEA training cluster (22.2%) were more likely to apply constraints to encourage VEA compared to coaches in the Low delivery of VEA training cluster (8.8%), for example “the constraints placed upon practices often lead players to scan more often” (P14, High delivery of VEA training cluster).

A total of 93 coaches (30.7% of the total number of coaches) reported that the delivery of VEA training was not a priority (Table 2). Comments on why VEA was not a priority included: not enough time for everything; other skills need to be developed; players had already mastered VEA. The Low delivery of VEA training cluster (47.1%) and the Moderate delivery of VEA training cluster (35.3%) were much more likely to report that VEA was not a priority compared to the High delivery of VEA training cluster (8.5%), for example “most players have different and more pressing needs” (P169, Low delivery of VEA training cluster). Furthermore, some of the coaches (n = 40, 13.2% of the total number of coaches) made comments referring to the barriers of delivering VEA. The following barriers were reported: VEA was difficult to coach; the coach perceived that they had a lack of knowledge regarding VEA; and that there was a lack of resources regarding VEA. The Low delivery of VEA training cluster (20.6%) and the Moderate delivery of VEA training cluster (13.1%) were more likely to report a barrier to delivering VEA than the High delivery of VEA training cluster (7.3%), for instance “It is a hard skill to put into a drill and practice” (P155, Low delivery of VEA training cluster).

Table 2. Analysis of the responses to the open-ended questions.

|  |  |  |
| --- | --- | --- |
| **Higher Order Theme** | **Lower Order Theme** | **Sub-themes** |
| Delivery of VEA training | Coach VEA using a variety of methods | Direct instructionApplying constraintsQuestioning |
|  | Coaching of VEA not a priority | Not enough time for everything Other skills need to be developedPlayers had already mastered VEA |
|  | Barriers to delivery of VEA training | VEA was difficult to coachLack of knowledge regarding VEALack of resources regarding VEA |
| When to introduce VEA | Start early | Helps to make the skill instinctiveYounger players learn more quicklyAllows players to accumulate more practice |
|  | Start at age-appropriate point | Master more basic elements first |
|  |  | When to introduce depends upon the playerWhen to introduce depends upon the game structure at that age grade |
| Evaluating VEA | Subsequent player behaviour | Awareness of surroundingsDecision makingQuality and/or speed of the technical action |
|  | Direct observation | General observationSpecific observation of head and/or body movement  |
|  | Assessing player understanding | Questioning |

*3.4 Evaluating VEA*

Coaches reported three main ways of evaluating players’ use of VEA (Table 2). A total of 175 coaches (48.6% of the total number of coaches) referred to the subsequent player behaviour following a VEA, with many coaches referring to multiple behaviours. Coaches from the High delivery of VEA training cluster (47.6%) and the Moderate delivery of VEA training cluster (44.4%) were more likely to provide an example of subsequent player behaviour than coaches from the Low delivery of VEA training cluster (31%). Comments frequently referred to a player evidencing an awareness of his/her surroundings, for example “if a player knows where he is, knows what's going on around him and moves accordingly (P76, High delivery of VEA training cluster). Alternatively, the coach might reference a player’s decision-making, for instance “the decision that they attempt to make once they receive the ball in relation to the picture that is in front of them” (P201, High delivery of VEA training cluster). Other comments referred to assessing the quality and/or speed of the technical action carried out by a player following a VEA, for instance “they are able to turn and make passes quickly as they know the general shape of the field (P61, Moderate delivery of VEA training cluster). A total of 143 coaches (47.2% of the total number of coaches) reported using a direct observation to evaluate VEA, this could involve a general “visual observation of each player” (P86, Low delivery of VEA training cluster) or a specific observation of “a head up and looking around” (P303, Low delivery of VEA training cluster). In contrast to the finding with player behaviours, coaches from the Low delivery of VEA training cluster (47.1%) were more likely to refer to direct observation than coaches in the Moderate delivery of VEA training (43.1%) or High delivery of VEA training (35.4%) clusters. Finally, a small number of coaches (n = 20, 6.6% of the total number of coaches) that were evenly distributed between the clusters mentioned verbally assessing a player’s understanding of a situation as a result of “asking questions about what they have seen” (P250, Moderate delivery of VEA training cluster).

**4. Discussion**

Research has begun to highlight that VEA is an important facet of skilled performance in football (Jordet et al., 2013). However, there is a lack of research on the knowledge of youth coaches and the type of practices utilised in the development of VEA. In order to address these gaps in the literature, the current study aimed to identify: (i) when VEA should be introduced; (ii) how VEA is delivered by coaches and; (iii) how coaches evaluate VEA. Further, this study explored whether groups of football coaches existed who differed in their approach to the delivery of VEA training and whether there were differences in the demographics of the coaches across these groups. Three clusters (groups) emerged, which were distinguished by the extent to which coaches engaged in the delivery of VEA training: Low VEA, Moderate VEA and High VEA. Within the Low delivery of VEA training cluster there was an over-representation of coaches with no qualification or a highest qualification of FA level 1; an over-representation of coaches who had been coaching for <1-2 years; and an over-representation of coaches who coach for <1-2 hours per week. It appears that a higher coaching qualification and experience (years coached and number of hours coached per week) leads to a positive attitude of coaching VEA (see also, Thomas & Wilson, 2014). However, this positive attitude to coaching VEA was not influenced by the ability and the age of players that are being coached. The critical factors that determine the use of coaching practices to develop VEA appear to be the qualification and experience of the coach. For football associations, this indicates that they would benefit from helping coaches to progress through the coaching qualification pathways and to provide appropriate opportunities for coaches to develop coaching experiences (Watts & Cushion, 2017). Moreover, it may be worthwhile for inexperienced coaches to work alongside experienced coaches who can act as mentors to help them develop their coaching practice (Jones, Harris & Miles, 2009).

*4.1 Introducing VEA*

Coaches predominantly suggested that training of VEA should be introduced at Under 8 or earlier. However, coaches in the Low delivery of VEA training cluster were more likely to delay introducing VEA coaching practices until age 11 or above than coaches in either the Moderate delivery of VEA training cluster or High delivery of VEA training cluster. One reason for this difference may lie in the perceived priority of developing technical aspects of skill prior to tactical or perceptual-cognitive skills (for a discussion, see Chow et al., 2007). Further to such distinction, in the current study, approximately 15% of coaches in both the Low delivery of VEA training and Moderate delivery of VEA training clusters specifically commented upon the need to master more basic elements (often specified as ball mastery) of the game first, compared to only 2% of coaches in the High delivery of VEA training cluster. It appears that some coaches are adopting a traditional coaching approach where technique needs to be mastered before game play (Evans, 2006) and it has been suggested that this approach could lead to a detachment between technique and tactical understanding (Light & Harvey, 2015). Alternatively, the later introduction of VEA may be associated with the greater use of direct instruction rather than a constraints-led approach by coaches in the Low delivery of VEA training cluster. As coaching for U8 and below is believed to be optimized through game-based and non-prescriptive coaching (Davids, Araújo, Correia, & Vilar, 2013) these findings in relation to the introduction of VEA reinforce the need to develop and promote evidence-based coaching interventions specifically targeting early years coaches.

*4.2 Delivery of VEA training*

The High delivery of VEA training cluster were likely to provide more feedback/instruction on VEA; they designed an activity or part of a session to focus on VEA more often; and the percentage of sessions they would primarily focus on VEA was higher compared to the Moderate delivery of VEA training and Low delivery of VEA training clusters. The most common method that coaches reported that they used to deliver VEA was direct instruction (e.g. “always saying ‘look up’, ‘check your shoulder’ during training and matches” P195, Low delivery of VEA training cluster). Instruction is a behaviour frequently used by football coaches (O’Connor, Larkin & Williams, 2018; Partington & Cushion, 2013), and previous research has suggested that an overly prescriptive approach to instruction can be detrimental for learning (Ford et al., 2010; Gabbett & Masters, 2011). Questioning is an alternative method by which VEA might be promoted (e.g. “I ask questions and provide feedback as to how to improve the effectiveness of their scanning” P123, Moderate delivery of VEA training cluster). Questioning was reported by a relatively small proportion of coaches and this is consistent with previous research that has revealed coaches rarely ask players questions (Cope, Partington, Cushion & Harvey, 2016). However, questioning is important for the development of desirable learner outcomes (i.e. enabling performers to critically reflect on their performance) (Cope et al., 2016). It would also be important for coaches to move beyond simplistic questioning (low order and convergent questions) and attempt to apply higher order and divergent questions to enhance performer learning of VEA in football practices (Harvey & Light, 2015).

Rather than direct interactions such as instruction or questioning, the modification of task constraints was an approach commonly reported by coaches in the High and Moderate delivery of VEA training clusters. Common modifications include altering the dimensions of the playing area, the number of players, the position of the goals, or the means of identifying teammates (e.g. bibs versus headbands). Previous literature and studies have demonstrated how such modifications can promote specific adaptations in game play (Davids, Button & Bennett, 2008; Buszard, Reid, Masters, & Farrow, 2016; Timmerman, Farrow, & Savelsbergh, 2017). However, research on constrained games has primarily focused on the number of technical actions performed (e.g., tackles, passes, shots on goal, etc; Capranica, Tessitore, Guidetti, & Figura, 2001; Katis & Kellis, 2009) rather than on VEA. McGuckian et al. (2017) conducted the only previous study that has explored the impact of modifying task constraints on the VEA of football players. This study highlighted that football players conducted more VEA when playing on a pitch with less space per player compared to playing on a pitch with the same amount of space as a full-size, 11 versus 11 match. Thus, further research is required to determine the particular task constraint manipulations which best support the development of VEA.

Some of the coaches made comments referring to the barriers of delivering VEA. The following barriers were reported: VEA was difficult to coach; the coach perceived that they had a lack of knowledge regarding VEA; and that there was a lack of resources regarding VEA. The Low delivery of VEA training cluster and the Moderate delivery of VEA training cluster were more likely to report a barrier to delivering VEA than the High delivery of VEA training cluster. For football associations, this would highlight that coaches require support in developing their understanding of VEA, with formal coach education courses being one possible way of achieving this (Stoszkowski & Collins, 2016). The production of resources for the delivery of VEA training is a key area for coach education provision to consider (Nelson, Cushion & Potrac, 2013). However, a first-phase of research is required to identify systematically how coaching practices can be designed to enhance VEA, before appropriate evidence-based interventions can be implemented.

*4.3 Evaluating VEA*

As considered, a contemporary question in the perceptual-cognitive skill literature concerns the optimisation of methods for the measurement and development of this aspect of expertise. A particular requirement has been the need to further develop on-field measures of perceptual-cognitive skill (van Maarseveen et al., 2016). In the current study, coaches offered some examples of how they evaluate and coach VEA. Coaches reported three main ways of evaluating players’ use of VEA: subsequent player behaviour, direct observation and assessing player understanding. Comparable to extant measures used in the VEA literature (Eldridge et al., 2013; Jordet, 2005b), a large number of coaches stated that they observed a player’s subsequent behaviour following VEA. These behaviours were divided across three areas of performance: awareness, decision-making and quality and/or speed of technical action. Previous studies have examined outcome measures including forward pass completion rates (Jordet et al., 2013) and coach determined decision-making (Pocock et al., 2017) in relation to VEA. Based on the current findings, a combined measure of awareness, decision-making and quality and/or speed of technical action may provide an appropriate candidate variable of VEA. Future studies would benefit from the further development of field-based measures of perceptual-cognitive expertise in order to develop understanding on the processes that underpin this aspect of skill.

Evaluating VEA by questioning players was only reported by a minority of coaches. Questioning could be implemented by stopping one player within a small-sided game, and asking him/her to provide an account of his/her thoughts over the previous 15-30 seconds (Eccles, 2012). By implementing questioning in this way, it is possible that players could be encouraged to use VEA to exploit sources of information that will support prospective actions. Although chiefly utilised in the context of closed motor skills such as golf strokes (Whitehead, Taylor, & Polman, 2016) or with coaches (Whitehead et al., 2016), such retrospective accounts have provided insight into the awareness and cognition of football players when responding to video footage under laboratory conditions (Roca et al., 2011). Future research should consider whether verbal reports could be fruitfully implemented within the more dynamic context of small-sided games.

The current article has only explored the perceptions of coaches regarding the introduction, delivery and evaluation of VEA. Future research should consider direct observations of coaching behaviour in regards to VEA. For example, a sizable proportion of the coaches in the current study have described applying a constraints-led approach (Davids et al., 2008). However, previous research has identified an epistemological gap between what football coaches want to achieve and the practices that they are implementing to bring about that result (O’Connor, Larkin & Williams, 2017; Partington & Cushion, 2013). Direct observation of coaching practice, coupled with retrospective interviews to establish the rationale behind selected behaviours (e.g., Collins & Collins, 2016; O’Connor, Larkin & Williams, 2017; Partington & Cushion, 2013), would provide a richer description of how VEA is developed as well as unearthing any relevant epistemological gaps.

In summary, the current study aimed to identify: (i) how VEA is delivered by coaches; (ii) when VEA should be introduced and; (iii) how coaches evaluate VEA. Further, this study explored whether groups of football coaches existed who differed in their approach to the delivery of VEA training and whether there were differences in the demographics of the coaches across these groups. Cluster analysis identified three clusters of coaches, which were distinguished by the extent to which coaches engaged in the delivery of VEA training: Low VEA, Moderate VEA and High VEA. The High delivery of VEA training cluster were likely to provide more feedback/instruction on VEA; they designed an activity or part of a session to focus on VEA more often; and the percentage of sessions they would primarily focus on VEA was higher compared to the Moderate delivery of VEA training and Low delivery of VEA training clusters. It appears that a higher coaching qualification and experience (years coached and number of hours coached per week) leads to a positive attitude of coaching VEA. Future research regarding VEA should consider direct observations of coaching behaviour in relation to VEA, as well as interviewing the coaches on the delivery of VEA training. From a practical perspective, further research should explore practice design and how this can be developed to enhance the use of VEA by performers.

**References**

Abraham, A., & Collins, D. (1998). Examining and extending research in coach development. *Quest*, *50*, 59-79.

Araújo D., Davids K., & Hristovski R. (2006). The ecological dynamics of decision making in sport. *Psychology of Sport and Exercise, 7*(6), 653–676.

Buszard, T., Reid, M., Masters, R., & Farrow, D. (2016). Scaling the equipment and play area in children’s sport to improve motor skill acquisition: A systematic review. *Sports Medicine, 46*(6), 829-843.

Capranica, L., Tessitore, A., Guidetti, L., & Figura, F. (2001). Heart rate and match analysis in pre-pubescent soccer players. *Journal of Sports Sciences, 19*(6), 379-384.

Carling, C. (2010). Analysis of physical activity profiles when running with the ball in a professional soccer team. *Journal of Sports Sciences, 28*(3), 319-326, DOI:10.1080/02640410903473851.

Chow, J. Y., Davids, K., Button, C., Shuttleworth, R., Renshaw, I., & Araujo, D. (2007). The Role of Nonlinear Pedagogy in Physical Education. *Review of Educational Research, 77*(3), 251-278.

Collins, L., & Collins, D. (2016). Professional judgement and decision-making in the planning process of high-level adventure sports coaching practice. *Journal of Adventure Education and Outdoor Learning, 16*(3), 256-268.

Cope, E., Partington, M., Cushion, C. J., & Harvey, S. (2016). An investigation of professional top-level youth football coaches’ questioning practice. *Qualitative Research in Sport, Exercise and Health*, *8*(4), 380-393.

Côté, J., & Abernethy, B. (2012). A developmental approach to sport expertise. In S. Murphy (Ed.), *The Oxford handbook of sport and performance psychology* (pp. 435–447). New York, NY: Oxford University Press.

Côté, J., Salmela, J. H., Baria, A., & Russell, S. J. (1993). Organizing and interpreting unstructured qualitative data. *Sport Psychologist, 7*(2), 127-137.

Davids, K., Button, C., & Bennett, S. J. (2008). *Dynamics of skill acquisition: a constraints-led approach*. Champaign, Il: Human Kinetics.

Davids, K., Araújo, D., Correia, V., & Vilar, L. (2013). How small-sided and conditioned games enhance acquisition of movement and decision-making skills. *Exercise and Sport Sciences Reviews, 41*(3), 154-161.

Dellal, A., Chamari, K., Wong, D., Ahmaidi, S., Keller, D., Barros, R., Biscotti, G. N., & Carling, C. (2011). Comparison of physical and technical performance in European soccer match-play: FA Premier League and La Liga. *European Journal of Sport Science, 11*(1), 51–59.

Dicks, M., Button, C., & Davids, K. (2010). Examination of gaze behaviors under in situ and video simulation task constraints reveals differences in information pickup for perception and action. *Attention, Perception, & Psychophysics, 72*(3), 706-720.

Eccles, D. W. (2012). Verbal reports of cognitive processes. In G. Tenenbaum, R. C. Eklund, & A. Kamata (Eds.), *Measurement in sport and exercise psychology* (pp. 103-117). Champaign, IL: Human Kinetics.

Eldridge, D., Pulling, C., & Robins, M. (2013). Visual exploratory activity and resultant behavioural analysis of youth midfield soccer players. *Journal of Human Sport and Exercise, 8*(3), S560-S577.

Evans, J. R. (2006). Elite level rugby coaches interpretation and use of game sense in New Zealand. *Asian Journal of Exercise & Sports Science, 3*(1), 17-24.

Everitt, B. S., Landau, S., Leese, M., & Stahl, D. (2011). *Cluster analysis* (5th Edition). Chichester: Wiley.

Ford, P. R., Yates, I., & Williams, A. M. (2010). An analysis of practice activities and instructional behaviours used by youth soccer coaches during practice: Exploring the link between science and application. *Journal of Sports Sciences, 28*(5), 483-495, DOI: 10.1080/02640410903582750.

Gabbett, T., & Masters, R. (2011). Challenges and solutions when applying implicit motor learning theory in a high performance sport environment: Examples from Rugby League. *International Journal of Sports Science & Coaching, 6*(4), 567-575.

Gibson, J. J. (1979). *The ecological approach to visual perception*. Boston: Hougthon Mifflin.

Hair, G., Black, B., Babin, B., Anderson, R., & Tatham, R. (2010). *Multivariate Data Analysis* (7th Edition). Upper Saddle River, New Jersey: Pearson.

Hancock, D. J., Young, B. W., & Ste-Marie, D. M. (2011). Effects of a rule change that eliminates body-checking on the relative age effect in Ontario minor ice hockey. *Journal of Sports Sciences, 29*(13), 1399-406, DOI: 10.1080/02640414.2011.593040.

Harvey, S., & Light. R. (2015). Questioning for learning in game-based approaches to teaching and coaching. *Asia-Pacific Journal of Health, Sport and Physical Education, 6(*2), 175-190.

Hutcheson, G. D., & Sofroniou, N. (1999). *The Multivariate Social Scientist: Introductory statistics using generalized linear models*. Thousand Oaks, CA: Sage Publication.

Jones, R. L., Harris, R., & Miles, A. (2009). Mentoring in sports coaching: A review of the literature. *Physical Education and Sport Pedagogy, 14*(3), 267-284.

Jordet, G. (2005a). Applied cognitive sport psychology in ball sports: an ecological approach. In R. Stelter and K.K Roessler (Eds.), *New approaches to sport and exercise psychology* (pp.147-174). Aachen, Germany: Meyer & Meyer Sport.

Jordet, G. (2005b). Perceptual training in soccer: An imagery intervention study with elite players. *Journal of Applied Sport Psychology, 17*, 140-156.

Jordet, G. (2008). *Visual exploration in premier league footballers*. 13th Annual ECSS Congress, July 9-12, 2008.

Jordet, G., Bloomfield, J., & Heijmerikx, J. (2013). *The hidden foundation of field vision in English Premier League soccer players*. MIT SLOAN Sports Analytics Conference Research Paper.

Katis, A., & Kellis, E. (2009). Effects of small-sided games on physical conditioning and performance in young soccer players. *Journal of Sports Science and Medicine, 8*(3), 374-380.

Light, R. L., & Harvey, S. (2015). Positive pedagogy for sport coaching. *Sport, Education and Society, 18*, 407-423.

McGuckian, T. B., Cole, M. H., & Pepping, G.-J. (2018). A systematic review of the technology-based assessment of visual perception and exploration behaviour in association football. *Journal of Sports Sciences*, *36*(8), 861-880.

McGuckian, T. B., Askew, G., Greenwood, D., Chalkley, D., Cole, M. H., & Pepping, G.-J. (2017). The impact of constraints on visual exploratory behaviour in football. In J. A. Weast-Knapp & G.-J. Pepping (Eds.), *Studies in Perception & Action XIV: Nineteenth International Conference on Perception and Action* (pp. 85 - 87). Abingdon, UK: Taylor & Francis.

Mooi, E., & Sarstedt, M. (2011). *A concise guide to market research.* Berlin: Springer-Verlag.

O’Connor, D., Larkin, P., & Williams, A. M. (2017). What learning environments help improve decision-making? *Physical Education and Sport Pedagogy*, *22*(6), 647-660.

O’Connor, D., Larkin, P., & Williams, A. M. (2018). Observations of youth football training: How do coaches structure training sessions for player development? *Journal of Sports Sciences, 36*(1), 39-47.

Nelson, L., Cushion, C., & Potrac, P. (2013). Enhancing the provision of coach education: the recommendations of UK coaching practitioners. *Physical Education & Sport Pedagogy, 18*(2), 204-218.

Partington, M., & Cushion, C. (2013). An investigation of the practice activities and coaching behaviors of professional top-level youth soccer coaches. *Scandinavian Journal of Medicine & Science in Sports, 23*, 374-382.

Partington, M., Cushion, C., & Harvey, S. (2014). An investigation of the effect of athletes’ age on the coaching behaviours of professional top-level youth soccer coaches. *Journal of Sports Sciences, 32*(5), 403-414, DOI:10.1080/02640414.2013.835063.

Patton, M. Q. (2015). *Qualitative Research & Evaluation Methods: Integrating theory and practice* (4th edition). London: Sage.

Pocock, C., Dicks, M., Thelwell, R. C., Chapman, M., & Barker, J. B. (2017). Using an imagery intervention to train visual exploratory activity in elite academy football players. *Journal of Applied Sport Psychology*, DOI:10.1080/10413200.2017.1395929.

Roca, A., Ford, P.R., McRobert, A.P., & Williams, A.M. (2011). Identifying the processes underpinning anticipation and decision-making in a dynamic time-constrained task. *Cognitive Processing, 12*(3), 301-310.

Smith, A.C., Roberts, J.R., Kong, P.W., Wallace, E., & Forrester, S. (2015). Golf Coaches' Perceptions of Key Technical Swing Parameters Compared to Biomechanical Literature. *International Journal of Sports Science and Coaching, 10*(4), 739-755, DOI: 10.1260/1747-9541.10.4.739.

Sparkes, A. C. (1998). Validity in qualitative inquiry and the problem of criteria: Implications for sport psychology. *Sport Psychologist, 12*(4), 363-386.

Stoszkowski, J., & Collins, D. (2016). Sources, topics and use of knowledge by coaches. *Journal of Sports Sciences, 34*(9), 794-802, DOI:10.1080/02640414.2015.1072279.

Thomas, J.R., & Nelson, J.K. (1996). *Research methods in physical activity* (3rd Edition). Champaign, Il: Human Kinetics.

Thomas, G. L., & Wilson, M. R. (2014). Introducing children to rugby: elite coaches’ perspectives on positive player development. *Qualitative Research in Sport, Exercise and Health, 6*(3), 348-365.

Thomas, G. L., Coles, T., & Wilson, M. R. (2017): Exploring mini rugby union coaches’ perceptions of competitive activities. *Sports Coaching Review, 6*(1), 94-107, DOI:10.1080/21640629.2016.1244425.

Timmerman, E. A., Farrow, D., & Savelsbergh, G. J. P. (2017). The effect of manipulating task constraints on game performance in youth field hockey. *International Journal of Sports Science & Coaching, 12*(5), 588-594.

Vaeyens, R., Lenoir, M., Williams, A., & Philippaerts, R. (2007). Mechanisms Underpinning Successful Decision Making in Skilled Youth Soccer Players: An Analysis of Visual Search Behaviors. *Journal of Motor Behavior, 39*(5), 395-408.

van der Kamp, J., & Dicks, M. (2017). Looking further! The importance of embedding visual search in action. *Behavioral and Brain Sciences, e158*, 45-46.

van der Kamp, J., Rivas, F., van Doorn, H., & Savelsbergh, G. (2008). Ventral and dorsal system contributions to visual anticipation in fast ball sports. *International Journal of Sport Psychology, 39*(2), 100-130.

van Maarseveen, M. J., Oudejans, R. R., Mann, D. L., & Savelsbergh, G. J. (2016). Perceptual-cognitive skill and the in situ performance of soccer players, *The Quarterly Journal of Experimental Psychology, 17*, DOI: 10.1080/17470218.2016.1255236

Ward, P., & Williams, A. M. (2003). Perceptual and cognitive skill development in soccer: The multidimensional nature of expert performance. *Journal of Sport and Exercise Psychology, 25*, 93–111.

Watts, D. W., & Cushion, C. J. (2017). Coaching journeys: longitudinal experiences from professional football in Great Britain*. Sports Coaching Review, 6*(1), 76-93.

Whelan, N., Kenny, I. C., & Harrison, A. (2016). An Insight into Coaches' Knowledge and Use of Sprinting Drills to Improve Sprinting Technique and Performance. *International Journal of Sports Science & Coaching, 11*(2), 182-190.

Whitehead, A. E., Taylor, J. A., & Polman, R. C. (2016). Evidence for Skill Level Differences in the Thought Processes of Golfers During High and Low Pressure Situations, Frontiers in Psychology, *7*(6), 1974, DOI: 10.3389/fpsyg.2015.01974

# Whitehead, A. E., Cropley, B., Huntley, T., Miles, A., Quayle, L., & Knowles, Z. (2016). ‘Think Aloud’: Toward a Framework To Facilitate Reflective Practice Amongst Rugby League Coaches, *International Sport Coaching Journal, 3*(3), 269-286.

Williams, A. M., & Davids, K. (1998). Visual search strategy, selective attention, and expertise in soccer. *Research quarterly for exercise and sport, 69*(2), 111-128.

Williams, A.M., Hodges, N.J., North, J., & Barton, G. (2006). Perceiving patterns of play in dynamic sport tasks: Investigating the essential information underlying skilled performance. *Perception, 35*, 317–332.

Williams, A. M., Ford, P. R., Eccles, D. W., & Ward, P. (2011). Perceptual‐cognitive expertise in sport and its acquisition: Implications for applied cognitive psychology. *Applied Cognitive Psychology*, *25*(3), 432-442.

1. This article will use the term VEA rather than scanning apart from when providing example questions from the questionnaire and when applying quotations from participants. [↑](#footnote-ref-1)