The art of the question: the structure of questions posed by youth soccer coaches during training

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The Art of the Question: The structure of questions posed by youth soccer coaches during training

Keywords: Coaching; Coaching Pedagogy; Learning; Football; Questioning

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STRUCTURE OF QUESTIONING IN FOOTBALL

Abstract

Background: From a sports perspective, pedagogical researchers have suggested questioning is an effective instructional tool and pedagogical strategy for developing critical thinking, problem-solving and decision-making skills. Questions enable coaches to contextualise athlete learning by encouraging and guiding them to identify and explore solutions to game-based problems. While previous investigations have explored the frequency of questions and provided some understanding of the interactions within a coaching session, there is still limited empirical knowledge related to the structure and profile of coach questioning strategies.

Purpose: This study aims to explore how youth soccer coaches, implementing the FFA National Curriculum, have used questioning techniques within specific coaching contexts/activities to promote athlete learning.

Method: Australian youth soccer coaches (i.e., U12 – U16; n = 19) were filmed during regular training sessions. A questioning profile coding system was developed and used to provide a detailed profile of the types of questions asked by the coaches in different coaching situations. The frequency of each coded event (i.e., type, context, who, what, knowledge, proximity, prompts, responses, activity, and effective) was recorded.

Data Analysis: Descriptive statistics (mean ± standard error) were used to describe all coded information. Association rule models were generated to determine the extent to which questioning profile descriptor (i.e., Question Type, Knowledge, Context, Who, What) occurred in the presence of another.

Results: Coaches asked on average 71 questions per session (0.88 questions per minute), with slightly greater use of convergent (i.e., closed) questions (52.2%) than divergent (i.e., open) questions (47.8%). Coaches use convergent questions that are instructional and promote lower
order thinking. In contrast, divergent questions are generally related to a game tactic or principle and are asked when the team has stopped an activity. The rule models indicated there is a general trend when considering the structure and profile of the type of question (i.e., convergent; divergent) asked in the different training session activity types. During drills and small-sided games, coaches asked convergent questions to the team, which were instructional in nature and required lower level knowledge. For large games, the question was more targeted to the individual while the activity was on-going, but still required lower level knowledge. Divergent questions generally related to game tactics although only 7% of these questions asked players to problem solve.

Conclusion: The results of the current study indicate that coaches are posing more questions within a coaching session, compared to previous studies, possibly reflecting the emphasis placed on questioning as an athlete learning strategy within the FFA National Curriculum. Association rule models provided greater insights into the distinct ‘styles’ or profiles typically implemented by coaches during specific types of activity. From a learning perspective, coaches should consider the players needs and wants when determining which type of question best suits the situation and be prepared to move between types of questions depending on player responses. Future research should consider the perspectives of coaches and athletes to determine why questions were asked, and how effective they were in reaching their intended purposes.

Keywords: Coaching; Coaching Pedagogy; Learning; Football; Questioning
Summary for practitioners

This study explored the structure and profile of questions used by 19 youth soccer coaches (U12-U16 years teams) within the coaching environment to promote athlete learning. Analysis found coaches asked on average 71 questions per session (0.88 questions per minute), with slightly more closed questions (52%) than open questions (48%). When using closed questions during drills and small-sided games, coaches asked lower order instruction questions to the team. When posing an open question during small and large games, the coach generally asks the players to stop where they are (freeze) and directs a tactical question to an individual player or the group. Open questions were evenly split between lower order and higher order questions although only 2-3 of these questions required players to problem solve. Coaches should consider players capabilities when determining which type of question best suits the situation and be prepared to move between cognitive levels depending on player responses.
The Art of the Question: The structure of questions posed by youth soccer coaches during training

Coaches have a significant impact on the learning outcomes and achievements of the athletes they seek to educate (Amorose 2007; Cushion 2010), with the behaviours they use shaping the teaching and learning environment (Partington and Cushion 2013). Therefore, the coach needs to convey important concepts to their athletes, which can be achieved by creating meaningful teaching and learning activities (O’Connor and Larkin 2015). In addition to this, coaches also have to ensure they develop critical thinking athletes who have a deeper understanding of the skills and tactics involved in the sports they play to ensure specific performance-based objectives are achieved (Pearson and Webb 2008). Within this context, researchers have identified a disconnection between evidenced-informed research and the applied coaching environment (Grehaigne, Godbout, and Bouthier 2001; O’Connor, Larkin, and Williams 2017). For example, while researchers have highlighted the benefit associated with more game-based or playing form activities for athlete development (e.g., provides a holistic approach to developing technical and tactical skills in a game-related learning environment; promotes player enjoyment and engagement; O’Connor, Larkin and Höner 2020), studies have still demonstrated an over reliance on drill-based or training form activities in youth sport coaching sessions (Ford, Yates and Williams 2010; Partington & Cushion 2013; Partington, Cushion and Harvey 2014).

Coach development programs are not always accessible to all coaches or informed by the latest research findings (Eather, Jones, Miller and Morgan 2020). Furthermore, the link between research and coach education programs is complex and generally not a linear relationship when considering course design and dissemination of new policies (Dempsey, Richardson, Cope and Cronin 2020). However, in an attempt to address this, the Australian soccer governing body, Football Federation Australia (FFA), has taken a research informed
approach to guide coaches on how to create learning environments to promote technical and
tactical athlete development. The National Curriculum (Football Federation Australia, 2013),
provides a philosophy on how the game should be played and guides youth coaches to structure
training sessions through a holistic approach to development, rather than trying to develop
individual components in isolation. To achieve this, the National Curriculum recommends that
coaches should create purposeful practice sessions, using the constraints-led approach and
manipulating task and environmental constraints provides opportunities for players to adapt to
various situations and explore solutions to problems within activities that are representative of
the sport context (Renshaw & Chow 2019). For example, activities are designed so players are
always perceiving-deciding-executing (one instructional skill-based activity followed by 2-3
game-based activities), coupled with quality feedback and questioning techniques. A key
element highlighted by the curriculum is for coaches to “Ask smart questions to develop player
understanding and enhance learning” (FFA curriculum, 2013; page 192). While this is a key
suggestion for coaches to employ, there is limited understanding about how coaches use
questioning techniques within a coaching session, and the type and structure of questions they
pose to athletes.

From a learning perspective, pedagogical researchers have found that questioning is an
effective instructional tool and pedagogical strategy to enhance learning outcomes in education
(Engin 2013; Walsh and Sattes 2016); medicine, (Adams 2015); and sport (Harvey and Light
2015; Kidman et al. 2001). Questioning techniques are critical for focusing attention to key
concepts, clarifying understanding (Engin 2013; Hill 2016; Tofade, Elsner, and Haines 2013),
memory recall (Caram and Davis 2005), stimulating high levels of thinking (Metzler 2000),
developing critical thinking (Shim and Walczak 2012), and problem-solving and decision-
making skills (Grehaigne et al. 2001; O’Connor, Wardak, Goodyear, Larkin, and Williams
2018). When players retrieve knowledge from their memory to answer a question this
reinforces the relevant cues and improves long-term retention of that information (Binks 2018; Dirkx, Kester, and Kirschner 2014). Therefore, coaches are encouraged to use questions, prompts, and feedback to contextualise the athletes’ learning by encouraging and guiding them to identify and explore solutions to game-based problems, rather than merely telling them what to do (O’Connor et al. 2020; Pill 2015, 2016).

While questioning is a key strategy for learning, coaches need to take into account the capabilities of the athlete and the coaching situation, to ensure they are matching questions to the athlete’s needs (Long, Blankenburg, and Butani 2015). In the literature, questions are commonly classified as either convergent or divergent. Convergent questions are closed in nature, and offer few response options. They assume a single answer, or a narrow range of ‘best’ answers (Tofade et al. 2013). In contrast, divergent questions are more open in nature, encouraging exploration of diverse perspectives, with multiple response, promoting deeper thinking (O’Connor, Larkin, and Williams 2018; Partington and Cushion 2013; Partington et al. 2014; Tofade et al. 2013). A further classification for questions can be based on the level of cognitive processing required to answer the question. Questions which require lower levels of cognitive processing, such as recall and comprehension, are classified as lower-order questions. In contrast, questions which involve analysis, synthesis and evaluation to generate new knowledge are classified as higher-order questions (Bloom, 1956; Metzler, 2000). While some researchers highlight the benefit associated with asking higher order questions to promote quality educational outcomes (Metzler, 2000; Chambers and Vickers 2006; Harvey, Cushion, and Massa Gonzalez 2010; McNeill et al. 2008; Praxedes et al. 2016), it should be noted that lower order questions also serve an important educational function to monitor understanding and to establish and situate a common understanding for new information or problems (Myhill and Dunkin, 2005). For example, recall questions can be used by coaches to focus athlete’s attention on actions or concepts which have previously been explored/learnt (Pearson and
Webb, 2008). Therefore, one effective questioning strategy is to start with convergent lower-order questions and progress to divergent higher-order questions, by building from the recall of facts to higher levels of thinking and problem solving (Caram and Davis, 2005; Engin, 2013). Progressing from simple questions to more difficult ones that require reasoning helps students develop cognitive abilities and critical thinking skills, through the formulation of, and reflection on, ideas that are needed for personal sense-making, which players can then test within the game-play environment (Cope et al. 2016; Light et al. 2014).

To understand how coaches use questioning within their sessions, researchers have conducted observational studies of the coaching environment. Results have shown that during a session coaches ask few questions to their athletes (between 2.29% and 7.83% of the session; Potrac, Jones, and Armour 2002; Potrac, Jones, and Cushion 2007; Partington and Cushion 2013; Partington, Cushion, and Harvey 2014). In addition to this relatively low frequency of questioning, it has also been found that coaches generally ask more convergent than divergent questions. Cope and colleagues (2016) built on prior observational research by exploring coaches’ questioning practice and the discursive nature of questioning approaches. They conducted conversational analysis of five youth soccer academy coaches’ training sessions. They found three underlying problematic themes: coaches wanting an immediate response from players, the use of leading questions to elicit a desired response, and the monological nature of coach/athlete interactions. The findings show coaches positioning themselves as gatekeepers of knowledge, with athletes cast as passive learners. O’Connor, Larkin and Williams (2017) found coaches asked more questions in their sessions (compared to earlier studies) and were aware of the need to use questions aimed at developing athlete decision-making skills.

Previous investigations have explored the use of questions within a coaching session in relation to the type and frequency of questions asked (Cope et al. 2016; O’Connor et al. 2017;
Partington et al. 2014). While this provides some understanding of how coaches use questions within a session, there is still limited exploration of the structure and context of questions asked by coaches within the coaching environment. Determining the structure and taxonomy of coach questioning strategies will provide insight in how they are used by coaches to potentially promote athlete learning. Therefore, this study aims to extend the current knowledge of coach questioning by exploring the structure and profile of questions used by youth soccer coaches, who are guided by the FFA National Curriculum, during specific contexts/activities within the coaching environment. This will provide a better understanding of the type of questions asked during specific contexts/activities within the session and how they are used by coaches to potentially promote athlete learning.

Method

Participants

Participants were selected for this study using a convenience-based sampling method, whereby clubs competing in the New South Wales National Premier League Youth competition (i.e., the highest level of youth participation) were contacted regarding participation. A total of 19 coaches who are currently coaching elite youth soccer teams (i.e., U12 – U16) and implementing the FFA National Curriculum volunteered to participate in the study. Of the 19 participants, 10 were coaching teams within the Skill Acquisition Phase of the FFA National Curriculum (i.e., U12 – U13), and nine participants were coaching within the Game Training Phase (i.e., U14 – U16). All teams played in 11 v 11 competitive matches, apart from the five Under 12 teams who play competitive 9 v 9 games. On average, coaches had been coaching for 9.76 (SD = 5.67) years. All participants were qualified youth coaches, with one coach holding a grassroots football certificate (i.e., Level 1), nine coaches had a Football Federation Australia (FFA) / Asian Football Confederation (AFC) C license (i.e., Level 2), and nine had an FFA/AFC B license (i.e., Level 3). Ethical approval was obtained from the lead institution’s
research ethics committee with informed consent provided by the participants. In addition, the parents and/or guardians of all the players within the teams provided informed consent prior to data collection.

**Instruments**

**Questioning Profile System.** A questioning profile coding system was developed to provide an understanding of how coaches use questioning in training sessions. The questioning profiling system was an extension to the Coach Analysis Intervention System (CAIS) (Cushion et al. 2012; Partington and Cushion 2013) used to measure coach behaviour. The questioning profile coding system was used to provide a detailed profile of the questions asked by the coaches during the coaching session. As indicated in Table 1, the coding system outlined the type of questions (i.e., convergent; divergent) and the context in which they were asked (i.e., freeze in position; player huddle; activity ongoing). Further, information relating to who the question was asked to (i.e., individual or team); what the question was about (i.e., instructional; tactics/principles; technique; problem solving; general) and whether the question required higher or lower order knowledge was also coded. To establish the content validity of the questioning profile system, definitions and content were examined by leading learning scientists and participants in two international coaching workshops. The questioning profile coding system measured the frequency and structure of questioning used by coaches.

**<<<INSERT TABLE 1 HERE>>>**

**Procedures**

Participants were filmed on two separate occasions at their regular ground using a digital video camera (Sony HDR PJ540E, Japan) in an elevated position to the side of the coaching area. Participants were instructed to conduct a regular training session, with the research team providing no additional information in relation to effective coaching/questioning strategies or the specific aims of the project. During the sessions, participants wore a lapel microphone and
hip mounted radio transmitter (Sennheiser EW112P, Germany), which transmitted the audio
signal to a radio receiver connected to the camera (Sony HDR PJ540E, Japan). This process
ensured both voice and video data were captured simultaneously. Due to logistical reasons,
three participants were only filmed on the one occasion (Skill Acquisition, $n = 1$; Game
Training, $n = 2$), resulting in a total of 35 recorded sessions, with an average duration of 81.0
(SD = 11.9) minutes per session. In total, over 47 hours (47:15:51; Hr:min:sec) of coaching
footage was coded for analysis purposes.

Following the coaching sessions, the video footage was analysed using Dartfish 7
(Dartfish, France). The questioning profile coding system was used to provide a detailed profile
of the questions asked by the coaches during the coaching session. The frequency of each coded
event (i.e., type; context; who; what; knowledge; and activity) was recorded. One independent
and trained coder coded each session; with an intra-coder agreement of 96%, indicating a high
level of agreement (Nunnally 1978).

**Practice Activity.** To assess the structure of the questions used in different coaching
session activities, the soccer practice activity coding system developed by O'Connor, Larkin
and Williams (2017) was employed. Therefore, the analysis considered the structure of
questions within five soccer-specific activities: session introduction; individual activity; drills;
small sided games (i.e., 2 v 2 to 4 v 4); and large games (i.e., 5 v 5 or greater) (see Table 1).

**Data analysis**

Data were coded and quantified for each questioning profile descriptor. Descriptive
statistics (mean ± standard error) were used to describe all coded information. A significant
alpha was set at 0.05, with effect size denoted as small ($r = 0.1 – 0.29$), medium ($r = 0.3 – 0.49$)
or large ($r = 0.5 – 1$) (Cohen 1992).

Association rule models were generated to determine the extent to which one
questioning profile descriptor (i.e., Question Type, Knowledge, Context, Who, What) occurred
in the presence of another. Association rules are algorithms which can identify underlying and
frequent non-linear patterns in a large dataset. The ‘Arules’ package was used to apply the
Apriori algorithm (Hahsler et al., 2019) to measure the levels of association between the five
types of questioning profile descriptor. Six separate models were constructed; one for each
session type (i.e., session introduction; individual activity; drill, small-sided game, large-sided
game) and one including All. For each model, a minimum support of 10% (i.e., any rules that
constituted less than 10% of total occurrences were not analysed) and confidence of 90% were
required in order for a rule to be constructed. All analyses were undertaken in the R computing
environment (version 3.6.1, Vienna, Austria).

Results

In total, 2495 questions were coded for the analysis. The descriptive statistics (i.e., mean;
standard deviation; minimum; maximum) from the questioning profile coding system are
presented in Table 2. In addition, the percentage of each coded descriptor is provided - relative
to the total number of questions asked per session. Descriptive statistics for the profile of
specific questions (i.e., divergent and convergent) are presented in Table 3. Table 4 shows the
distribution of time across different types of activities. It shows that the largest proportion of
coaching time was allocated to larger and small sided games.

Results from each of the six rule models are reported below. For each model, two rules
are presented. These rules (a) meet each of the selection criteria reported for each model and
(b) have practical relevance from a coaching perspective. In combination, they illustrate the
utility of the analysis with respect to the aims of the study. To provide further context relating
to the rules, examples from the data are also presented.
Overall Session

A total of 2495 questions were asked during the whole session model. Among the most notable patterns was one captured by ‘Rule 8’, which consisted of: Type of Question=Convergent/Closed Question Context=Freeze Who=Team What=instructional 253 => Knowledge=Lower Order 253 <confidence:(1)>.

This rule indicates, with 100% confidence, for the 253 occasions when a convergent question is posed, that it is instructional, to the team, during a freeze and only requires lower order knowledge.

Rule 25. Context=Freeze What=Tactics/Principle Knowledge=Higher Order 392 => Type of Question=Divergent/Open Questions 380 <confidence:(0.97)>. This rule indicates, with 97% confidence, for 392 occasions when the coach asks the players to freeze, and asks a tactics/principle and higher order question, most of these are divergent questions (380 instances).

Session Introduction

A total of 109 questions were asked in the session introduction model. Among the most notable was ‘Rule 11’ which consisted of: Type of Question=Convergent/Closed Question Who=Team Knowledge=Lower Order 39 => Context=Player Huddle 39 <confidence:(1)>.

This rule indicates, with 100% confidence, for the 39 occasions when a lower order convergent question is posed to the team, it occurs in a player huddle.

At the start of the session, for the coach to determine the physical condition of the players (as this may influence the structure of the session), coaches would bring the players into a huddle, and ask convergent questions to the team related to the previous day’s session or game (external to the coaches session; school game), for example, “How did you all go yesterday? Any injuries?” (Coach 7).

Rule 37. Type of Question=Divergent/Open Questions Who=Team What=Tactics/Principle 23 => Context=Player Huddle 23 <confidence:(1)>. The rule indicates, with 100%
confidence, for the 23 occasions when the coach asks a divergent question to the team related to tactics/principles, it occurs in a player huddle.

At the start of a session the coach would introduce the session aim and then clarify what the players knew in relation to this aim, for example with the players in a huddle the coach would ask a question such as “what do we know about running with the ball and protecting it?” (Coach 11) or “why do we want to have good first touch into space?” (Coach 19).

**Individual Activity**

A total of 57 questions were asked in the Individual Model. Of the 30 rules output, Rule 6 consisted of Type of Question=Convergent/Closed Question Who=Team What=instructional 28 ==> Knowledge=Lower Order 28 <confidence:(1)>. This rule indicates, with 100% confidence, for the 28 occasions when a convergent question is posed to the team and is instructional, it involved lower order thinking.

During an individual activity, such as the session warm-up, coaches would provide instruction questions to the players such as, “Can we slow down the jog coming back please - it is too fast” (Coach 10).

Due to the small number of divergent open questions asked (n = 9), no rules met the 10% minimum support and therefore no rules were created.

**Drill**

A total of 622 questions were asked in the Drill model. Among the most salient rules, ‘Rule 9’ consisted of: Type of Question=Convergent/Closed Question Context=Freeze Who=Team What=instructional 103 ==> Knowledge=Lower Order 103 <confidence:(1)>. This rule indicates, with 100% confidence, for the 103 occasions when a convergent question is posed to the team during a freeze and is instructional, it involves lower order thinking.
During an activity, the coach stops the drill and checks what the players were doing wrong.

Following another demonstration, the coach then makes sure the players understand the task properly – “Everybody understand what we are doing then?” (Coach 17).

Rule 24. Context=Freeze What=Tactics/Principle Knowledge=Higher Order 101 ==> Type of Question=Divergent/Open Questions 98 <confidence:(0.97)>. The rule indicates, with 97% confidence, for 101 occasions when the coach asks a question during a freeze about tactics/principles of a higher order, the majority of the time it was a divergent question (98 instances).

During a drill, the coach stops the activity and gets the players to freeze in position. They then ask a question related to the tactical principle they were highlighting in the activity – “If you come in to receive, can you hit Player 1? Why were you sitting so far away and what happened as soon as you came out here?” (Coach 5).

Small sided Games

The small-sided game Model included 872 questions. One notable example of the 30 rules output was Rule 8. Type of Question=Convergent/Closed Question Context=Freeze Who=Team 117 ==> Knowledge=Lower Order 115 <confidence:(0.98)>. This rule indicates, with 98% confidence, for the 117 occasions when a convergent question is posed to the team during a freeze, the majority of times it involved lower order knowledge (115 instances).

After briefly observing a small sided game, coaches will generally stop the activity and get the players to freeze in position and then ask convergent questions to the group in relation to the focus of the activity, for instance, “Do you understand the shape with how you will defend? One goes, one stays?” – (Coach 12) and “now can you see all the passing lanes you’ve got?” (Coach 2).

Rule 24. Type of Question=Divergent/Open Questions Who=individual or group but others are waiting What=Tactics/Principle 139 ==> Context=Freeze 131 <confidence:(0.94)>.
rule indicates, with 94% confidence, for 139 occasions when the coach asks a divergent question about tactics/principles, to a player or group and the other players are waiting, this generally occurs in a freeze (131 instances).

During a small sided game, coaches generally have the players freeze in position and then ask questions to an individual player while the group waits for the response. For instance, “When XX has the ball and the defenders are like that, where could you go to receive the ball?” (Coach 14); or “XX after you made that pass you looked to see where the reds were – where were they?” [player responds]; “and where did you go?” [player responds]; and where is there no one? [player responds] (Coach 1).

**Large Games**

For the large games, 835 questions were considered in the rule model. Rule 6 - Type of Question=**Convergent/Closed Question** Who=Individual Player other keep going 114 ==> Knowledge=Lower Order 114 <confidence:(1)>. This rule indicates, with 100% confidence, for the 114 occasions when a convergent question is posed to an individual player while the other players keep playing, it involves lower order thinking.

During a large sided game, coaches generally asked questions on the go, for instance, they would enter the playing area and speak to a player off the ball and ask them a question, such as “XX was your first touch into space??” (Coach 9) or “Can we create opportunities to get one of our players into midfield in control possession?” – (coach 16).

Rule 29. Type of Question=**Divergent/Open Questions** Who=individual or group but others are waiting What=Tactics/Principle 143 ==> Context=Freeze 132 <confidence:(0.92)>. The rule indicates, with 92% confidence, for 143 occasions when the coach asks a divergent question about tactics/principles, to a player or group and the other players are waiting, this mainly occurs in a freeze (132 instances).
During a large sided game, coaches generally asked tactical/principle divergent questions to an individual player within a freeze situation. For example, “It was a 3v1, what led you to decide to dribble out of that situation?” (Coach 17) or “XXX how are you helping your teammates there?”; “what could you have done better here?” and “XXX where do you need to be” (Coach 11).

Discussion

Researchers have explored questioning in a sports coaching context in relation to frequency of questions and athlete-coach interactions (Cope et al. 2016; Ford et al. 2010; O’Connor et al. 2017; Partington and Cushion 2013; Partington et al. 2014). However, little is known about the structure and taxonomy of coach questioning strategies. The results of the current study highlight how youth soccer coaches, implementing the FFA National Curriculum, have used questioning techniques within specific coaching contexts/activities to potentially promote athlete learning. From a descriptive perspective, coaches asked on average 71 questions per session (0.88 questions per minute), with slightly more use of convergent (i.e., closed) questions (52.2%) than divergent (i.e., open) questions (47.8%). From a structural perspective, generally coaches use convergent (i.e., closed) questions that are instructional and involve lower order thinking. In contrast, divergent (i.e., open) questions are generally related to a game tactic or principle and are asked when the team has stopped an activity. Ideally, coaches should move between types of questions based on the needs of their athletes and the nature of the situation. For example, coaches may start with questions of recall and understanding and get players to build on this knowledge by progressing to asking players to interpret cues, analyse the situation, develop solutions/actions and then evaluate their previous decisions and actions in determining what worked and what didn’t. If players struggle to find answers, then coaches can rephrase the question, provide players more time to respond, or let them work together to come up with solutions (Hill 2016; Long et al 2015).
In comparison to previously published findings (Harvey et al., 2010; Partington and Cushion 2013; Partington et al. 2014), the descriptive results from the current study would suggest coaches pose more questions to their athletes within a coaching session. This potentially reflects the emphasis placed on questioning as an athlete learning strategy within the FFA National Curriculum. In addition, the current results indicate coaches ask a higher proportion of divergent questions during a session than previously reported (Harvey et al. 2010; Partington and Cushion 2013; Partington et al. 2014). However, it should be noted the large SD (34 ± 25) recorded indicates considerable variation between coaches in their use of this questioning technique. This finding could be due to several factors, including the confidence of the coach to ask divergent questions, coach understanding of their athletes’ needs and capabilities (Long et al. 2015; Caram and Davis, 2005), or the belief that divergent questions develop decision-making skills (O’Connor et al. 2017; O’Connor et al. 2018). While this was not specifically an aim of the current paper, further research should consider elaborating on this by asking coaches to recall why they have posed a certain question, and at that specific time in the session.

From a model perspective, rule-based solutions are particularly useful when multiple features exist in large datasets, as analytical approaches like this are able to help identify meaningful patterns in situations where researchers are overwhelmed by the data and unable to recognise such patterns without such an aide. They do so not only by identifying complex interactions between features, but also identifying the frequency of these interactions within a data set. In this paper, they have the benefit of describing questioning behaviour/profiles of coaches during certain sections of a training session in enhanced detail. This can lead to greater insights into the efficacy of such approaches, or to help better define the distinct ‘styles’ or profiles typically implemented by a coach or in a particular activity. As access to more data types continues to grow in these environments, the benefit of these analytical approaches over
human observations will only become more pronounced. The rule models indicated some clear patterns when considering the structure and profile of the type of question (i.e., convergent; divergent) asked in the different training session activity types. For convergent questions, the rule based analysis indicated that across individual, drills and small-sided games, coaches asked questions to the team, which were instructional in nature and required lower level knowledge. This may be an example of a naïve form of constructivism whereby coaches’ use instructional questions and believe they are effective (as they are questioning rather than telling them what to do), however, they may actually be limiting the players knowledge, as they are not able to construct new knowledge (Cope and Cushion, 2020; Cushion, 2013). As such, the ‘power’ of learning is still with the coach who is making the decisions and determining the subsequent player actions (i.e., how the game may be played – 3 touches etc…).

For large games, the convergent question was more targeted to the individual while the activity was on-going, but still required lower level knowledge. While lower order questioning requires only lower levels of cognition and positions the athletes as responders, a coach may use this type of questioning to assess athlete understanding (i.e., “which passing option is best from here, forward or backwards?”), recall of key cues (i.e., “when you see the defence step up, what should you do?”), comprehending the activity (i.e., “does everyone understand what we are doing in the activity then?”), and direct the athlete’s attention toward specific aspects of the game environment and potential outcomes (Raab and Johnson 2007). Further, the responses players provide to questions posed may assist the coach in deciding when and how to progress the activity or session (Mitchell, Oslin and Griffin 2006).

With respect to divergent questioning there is a greater focus on higher order thinking, through the formulation and reflection of ideas. It also stimulates critical thinking and problem solving which players can then test within the game-play environment (Chambers and Vickers 2006; Cope et al. 2016; McNeill et al. 2008; Partington and Cushion 2013; Praxedes et al.
The divergent questioning rule models for each type of activity indicate coaches generally ask the question to the whole group, with the question having an emphasis on a key game tactic or principle. The potential benefit associated with divergent questions is they promote deeper level thinking; stimulating the athletes to go beneath the surface appearance of the problem (Kracl 2012). However, it should be noted that while divergent questions should provide more opportunities for higher order thinking, in the current study, approximately 50% of the divergent questions asked by coaches only required lower order thinking - that is, questions which assess an individual’s ability to recall and understand a single fact about the sport-specific problem. Further evidence of this was that only 7% of divergent questions asked players to problem solve. This potentially reduces athletes’ opportunities to evaluate a situation and formulate their next decision or action. This finding supports education-based research which indicates that, despite evidence to suggest the benefit to learning from the use of divergent higher-order questions, this is not reflected in practice, with teachers predominantly using lower-order, recall questions (Jiang 2014; Tan 2007). However, using limited problem-solving questions may reflect the capability of the athletes, within the specific context, to respond to such questions. Asking unrealistically challenging questions may lead athletes to lose self-confidence and becoming disengaged from the task (Long et al. 2015). Therefore, as researchers highlight the relationship between the complexity/type of question posed and the level of athlete thinking required for depth of learning (Chambers and Vickers 2006; Cope et al. 2016; McNeill et al. 2008; Praxedes et al. 2016), coaches should consider when it is appropriate to use higher order problem solving divergent questions to promote athlete development.

While the results may suggest coaches are attempting to ask more questions to their athletes in comparison to previous studies (Potrac et al. 2002; Potrac et al. 2007; Partington and Cushion 2013; Partington et al. 2014), more attention needs to be paid to who they are
posing the question to. The results suggest the coaches predominately pose divergent questions
to the whole group. However, whole group questioning has been shown to be less effective for
athlete understanding compared to inductive questioning scaffolded for an individual or small
group (Cope et al. 2016; McNeill et al. 2008). A potential issue with posing whole group
questions is some athletes will not answer a question while others may dominate the responses.
This may be influenced by the confidence of the athlete in their ability to articulate their
thoughts. Coaches could address this issue by giving everyone time to think of an answer before
asking one or more players to share their answers. Further, coaches need to be aware of whether
the question relates to the whole team or specific athletes. If they believe the question is
important for the whole group, then they need to ensure everyone is fully engaged (i.e. all
athletes can hear and potentially respond). However, if the question is only relevant for one or
several players, they could consider whether questioning on the run is more effective. Harvey
and Light (2015) recommend the ‘debate of ideas’ as a strategy coaches can employ to achieve
greater athlete engagement and discussion during several ‘tactical time-outs’. Based on
Grehaigne, Richard and Griffin’s (2005) framework of four generic tactical questions, the
coach pre-plans the questions for small groups of players to discuss while the coach moves
from group to group listening and adding probing questions if required. The scaffolded
questions encourage players to reflect, analyse and debate amongst themselves, providing a
better understanding of each other’s perspectives (Harvey and Light 2015; Hill, 2016).
Therefore, while coaches may be encouraged to use questioning within the learning
environment to promote student/athlete learning (Butler 2005; Cope et al. 2016; Football
Federation Australia, 2013) there is still limited empirical evidence to demonstrate their
practical effectiveness as an athlete teaching and learning strategy.

While researchers promote the benefits associated with effective questioning techniques
(Chambers and Vickers 2006; Cope et al. 2016; McNeill et al. 2008; Praxedes et al. 2016),
when exploring questioning techniques and performance, interventions tend to couple questioning techniques with other pedagogical tools, such as instruction or feedback behaviours (Chambers and Vickers 2006; Garcia-Gonzalez, et al. 2014). The lack of studies which have focused on questioning as a learning strategy within interventions impacts the ability to establish causal relationships between teacher questioning and student learning outcomes. While we acknowledge it would be challenging for researchers to develop interventions to isolate questions as a pedagogical technique (e.g. ‘test’ questions providing retrieval practice; Binks 2018 Dirkx et al. 2014), researchers should consider taking an ecological research approach by examining the combination of learning environment, questioning strategies, and learner preparation that makes for success.

This is one of the first studies to explore the nature and structure of coach questioning within real coaching environments. Findings are limited by some aspects of the study design and further research is needed to pursue some of the following matters more deeply. First, while the data provides an overview of the number of questions asked during certain activities, the time engaged in each kind of activity was not equal and therefore direct comparisons between the number and type of questions asked during each kind of activity is not straightforward. Future studies exploring the structure of coaches’ questions may control for the time invested in certain activities to provide clear comparisons between the structures of questions within these different practice activities. Second, the data collected provide a descriptive account of the type of question, when it was asked and to whom. However, the data do not allow exploration of why the question was asked - the specific purpose for the question. Further, we acknowledge the lack of player voice in the study, which may also limit the understanding of the outcome of the intended question. Future studies should consider the perspectives of coaches and athletes to determine why questions were asked, and how effective they were in reaching their intended purposes. Finally, the data collected does not consider the effect of the
questioning on the athletes performance. While questioning has been proposed as an effective pedagogical tool (Harvey and Light 2015; Kidman et al. 2001; O’Connor et al. 2018), the current findings do not indicate how the question may have effected athlete performance of a skill, either positively or negatively. Future studies may consider implementing an intervention program which measures the impact of a certain questioning technique or style and the potential benefits they may have on athlete performance.

Conclusion

In summary, our findings show that youth soccer coaches use an array of questioning types to potentially promote athlete learning. In comparison to previous research, coaches pose more questions (Harvey et al., 2010; Partington and Cushion 2013; Partington et al. 2014), of which a higher proportion are divergent questions (with these evenly split between lower order and higher order questions), which possibly reflects the FFA National Curriculum’s emphasis on questioning as an athlete learning strategy. The rule models extends current knowledge by revealing clear patterns when considering the structure and profile of questions, for example, when divergent questions are asked during small-sided games and large games, the coach generally asks the players to stop where they are (freeze) and directs a tactical question to an individual player or the group. Convergent questions on the other hand, were predominantly instructional, involving lower order thinking. While lower order questioning requires only lower levels of cognition to assess athlete understanding, recall, comprehension, and direct attention toward specific information, coaches should consider players capabilities when determining which type of question best suits the situation and be prepared to move between cognitive levels depending on player responses.

This research provides an understanding of current coach questioning practice, and by knowing what we currently do we can modify practice to create better opportunities for athlete learning. A key application for coaches is taking the time to specifically plan questions to
ensure they guide and promote particular athlete knowledge and behavioural actions (Pill, 2016). To achieve this coaches may consider scaffolding questions within the session to ensure an appropriate sequence of questions addressing athlete learning needs while building towards more complex understanding and applications (Pill, 2016). Overall, the findings from the study provide an initial exploration of the type of questions asked by coaches within the coaching environment, to provide insight in how they are used by to potentially promote athlete learning. To develop further understanding, future research should consider coaches and athletes perspectives to determine the purpose of questions asked and how effective they were in reaching their intended purpose. Although the current study is unable to determine the explicit impact of FFA’s focus of questioning techniques to promote athlete learning, researchers may now consider implementing intervention programs which examine how questioning techniques impact athlete learning.
References


Champaign, IL: Human Kinetics


Table 1. The category, sub-category, definitions, and associated examples of the questioning profile system.

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-Category</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Question</td>
<td>Convergent</td>
<td>Any question to player(s) that have a limited number of responses/options (i.e., yes/no; one word answers; closed questions). e.g., “Which is the best passing option from here, forward or back?” Which team has possession of the ball?”</td>
</tr>
<tr>
<td></td>
<td>Divergent</td>
<td>Any question to player(s) that have a the potential for multiple responses/options (i.e., why questions; open ended questions) e.g., “What options do you have available for you in this situation?” “When do you think it might be a good option to close the player down?” “What can you do to help the player in possession of the ball?”</td>
</tr>
<tr>
<td>Context</td>
<td>Freeze in Position</td>
<td>Coach stops the activity to talk to the players and the players remain in their current position during the activity. e.g., “stop and hold there…” “ok just stop in your position”</td>
</tr>
<tr>
<td></td>
<td>Player Huddle</td>
<td>Coach stops the activity and gets the players to come together for a group discussion lead by either the coach or a player. e.g., “stop and bring it in…”</td>
</tr>
<tr>
<td></td>
<td>Activity On-going</td>
<td>The coach has not stopped the activity, with the players still actively engaged in the activity e.g., players are actively participating in an activity</td>
</tr>
<tr>
<td>Who</td>
<td>Individual player; Others Continue Activity</td>
<td>A question is asked by the coach to an individual player while the rest of the team continue in the activity e.g., coach shadows a players during the activity and speaks to them while they are still playing the game</td>
</tr>
</tbody>
</table>
### Structure of Questioning in Football

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group; Others Continue Activity</strong></td>
<td>A question is asked to more than one player, however the rest of the team continue to participate in the activity</td>
</tr>
<tr>
<td></td>
<td>e.g., coach pulls a small group of players from the game and asks a question</td>
</tr>
<tr>
<td><strong>Individual or Group but Others are Waiting</strong></td>
<td>A question is asked to one or more players, however the rest of the team are not actively participating in an activity and waiting for direction from the coach</td>
</tr>
<tr>
<td></td>
<td>e.g., coach singles out one player to answer the question</td>
</tr>
<tr>
<td><strong>Team</strong></td>
<td>A question is posed to the whole team</td>
</tr>
<tr>
<td></td>
<td>e.g., coach asks a question to the team and anyone can respond</td>
</tr>
<tr>
<td><strong>Instructional</strong></td>
<td>The question is about the specific activity the group are doing</td>
</tr>
<tr>
<td></td>
<td>e.g., how many touches are we focusing on in this activity?</td>
</tr>
<tr>
<td><strong>Tactics/principles</strong></td>
<td>The question is related to the tactics or principles of the game</td>
</tr>
<tr>
<td></td>
<td>e.g., how can we slow the momentum of the game?</td>
</tr>
<tr>
<td><strong>What Technique</strong></td>
<td>The question is related to the performance of a technical skill, such as a pass</td>
</tr>
<tr>
<td></td>
<td>e.g., what determines the direction the ball will go?</td>
</tr>
<tr>
<td><strong>Problem-solving</strong></td>
<td>The question relates players understanding what to do, when to do it and why</td>
</tr>
<tr>
<td></td>
<td>e.g., How can you stop that player receiving the ball?</td>
</tr>
<tr>
<td><strong>General</strong></td>
<td>A question not related to a sport-specific learning or performance</td>
</tr>
<tr>
<td></td>
<td>e.g., &quot;did anyone see John today?&quot;; &quot;did you watch the game last night?&quot;</td>
</tr>
<tr>
<td><strong>Knowledge</strong></td>
<td>Questions which require the player to comprehend the topic, situation or solution to a sport-specific problem</td>
</tr>
<tr>
<td><strong>Higher order</strong></td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Small-Sided-Activities</td>
</tr>
<tr>
<td>----------------</td>
<td>----------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Drills</td>
<td>Activities during training whereby the player is performing predetermined actions or movements. There is a set sequence to the activity with minimal options available to the player. e.g., passing from cone to cone, dribbling around cones, sequence passing (i.e., players have to pass to a specific person next)</td>
</tr>
<tr>
<td>Individual</td>
<td>Activities during training whereby the player is working on skills by oneself. e.g., juggling, running a lap with the ball</td>
</tr>
<tr>
<td>Session Introduction</td>
<td>The introduction to the training session which is general and not related to a specific training session activity</td>
</tr>
<tr>
<td></td>
<td>e.g., introducing the training sessions main content, discussing the previous game</td>
</tr>
<tr>
<td>Lower order</td>
<td>Questions which only assess players ability to recall a single fact about the sport-specific problem</td>
</tr>
<tr>
<td></td>
<td>e.g., what went wrong then?</td>
</tr>
<tr>
<td>Transitions</td>
<td>Periods of time were the players are moving (or transitioning) between activities or inactivity periods</td>
</tr>
</tbody>
</table>
Table 2.

Descriptive statistics of the coded questions asked during a youth soccer coaching session.

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-Category</th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Percentage of Total Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Convergent</td>
<td>37.20</td>
<td>12.04</td>
<td>15</td>
<td>62</td>
<td>52.18</td>
</tr>
<tr>
<td></td>
<td>Divergent</td>
<td>34.09</td>
<td>25.41</td>
<td>1</td>
<td>98</td>
<td>47.82</td>
</tr>
<tr>
<td>Context</td>
<td>Huddle</td>
<td>13.94</td>
<td>9.03</td>
<td>0</td>
<td>38</td>
<td>19.55</td>
</tr>
<tr>
<td></td>
<td>Activity Ongoing</td>
<td>18.66</td>
<td>12.21</td>
<td>1</td>
<td>43</td>
<td>26.17</td>
</tr>
<tr>
<td></td>
<td>Freeze</td>
<td>38.69</td>
<td>19.25</td>
<td>2</td>
<td>99</td>
<td>54.27</td>
</tr>
<tr>
<td>Who</td>
<td>Team</td>
<td>36.91</td>
<td>15.70</td>
<td>9</td>
<td>74</td>
<td>51.78</td>
</tr>
<tr>
<td></td>
<td>Individual or group but others are waiting</td>
<td>19.20</td>
<td>14.15</td>
<td>2</td>
<td>74</td>
<td>26.93</td>
</tr>
<tr>
<td></td>
<td>Group - others keep going</td>
<td>4.57</td>
<td>7.13</td>
<td>0</td>
<td>32</td>
<td>6.41</td>
</tr>
<tr>
<td></td>
<td>Individual - others keep going</td>
<td>10.60</td>
<td>8.23</td>
<td>1</td>
<td>35</td>
<td>14.87</td>
</tr>
<tr>
<td>What</td>
<td>Technique</td>
<td>4.26</td>
<td>5.18</td>
<td>0</td>
<td>28</td>
<td>5.97</td>
</tr>
<tr>
<td></td>
<td>Instructional</td>
<td>20.94</td>
<td>9.84</td>
<td>5</td>
<td>45</td>
<td>29.38</td>
</tr>
<tr>
<td></td>
<td>General Questions</td>
<td>4.60</td>
<td>3.73</td>
<td>0</td>
<td>13</td>
<td>6.45</td>
</tr>
<tr>
<td></td>
<td>Tactics/principles</td>
<td>38.86</td>
<td>24.38</td>
<td>1</td>
<td>104</td>
<td>54.51</td>
</tr>
<tr>
<td></td>
<td>Problem Solving</td>
<td>2.63</td>
<td>3.49</td>
<td>0</td>
<td>18</td>
<td>3.69</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Lower order</td>
<td>53.89</td>
<td>17.81</td>
<td>17</td>
<td>88</td>
<td>75.59</td>
</tr>
<tr>
<td></td>
<td>Higher order</td>
<td>17.40</td>
<td>13.36</td>
<td>0</td>
<td>50</td>
<td>24.41</td>
</tr>
<tr>
<td>Practice Activity</td>
<td>Session Introduction</td>
<td>3.11</td>
<td>4.45</td>
<td>0</td>
<td>16</td>
<td>4.37</td>
</tr>
<tr>
<td></td>
<td>Individual</td>
<td>1.63</td>
<td>3.88</td>
<td>0</td>
<td>19</td>
<td>2.28</td>
</tr>
<tr>
<td></td>
<td>Drills</td>
<td>17.77</td>
<td>16.86</td>
<td>0</td>
<td>79</td>
<td>24.93</td>
</tr>
<tr>
<td></td>
<td>Small-Sided Games</td>
<td>24.91</td>
<td>22.81</td>
<td>0</td>
<td>85</td>
<td>34.95</td>
</tr>
<tr>
<td></td>
<td>Large Games</td>
<td>23.86</td>
<td>20.44</td>
<td>0</td>
<td>67</td>
<td>33.47</td>
</tr>
</tbody>
</table>
Table 3.

The percentage of divergent ($M = 34.09$) and convergent ($M = 37.20$) questions relative to the specific coded sub-category.

<table>
<thead>
<tr>
<th></th>
<th>Divergent Questions (Mean = 34.09)</th>
<th>Convergent Questions (Mean = 37.20)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td><strong>Context</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Huddle</td>
<td>6.40</td>
<td>6.34</td>
</tr>
<tr>
<td>Activity Ongoing</td>
<td>5.11</td>
<td>7.24</td>
</tr>
<tr>
<td>Freeze</td>
<td>22.54</td>
<td>17.50</td>
</tr>
<tr>
<td><strong>Who</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Team</td>
<td>16.71</td>
<td>13.21</td>
</tr>
<tr>
<td>Individual or group but others are waiting</td>
<td>11.37</td>
<td>10.95</td>
</tr>
<tr>
<td>Group - others keep going</td>
<td>2.66</td>
<td>4.55</td>
</tr>
<tr>
<td>Individual - others keep going</td>
<td>3.31</td>
<td>5.66</td>
</tr>
<tr>
<td><strong>What</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technique</td>
<td>1.69</td>
<td>2.42</td>
</tr>
<tr>
<td>Instructional</td>
<td>1.57</td>
<td>2.39</td>
</tr>
<tr>
<td>General Questions</td>
<td>0.46</td>
<td>0.95</td>
</tr>
<tr>
<td>Tactics/principles</td>
<td>27.71</td>
<td>22.69</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>2.63</td>
<td>3.49</td>
</tr>
<tr>
<td><strong>Knowledge</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower order</td>
<td>17.17</td>
<td>13.82</td>
</tr>
<tr>
<td>Higher order</td>
<td>16.89</td>
<td>13.22</td>
</tr>
<tr>
<td><strong>Practice Activity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Session Introduction</td>
<td>1.37</td>
<td>2.13</td>
</tr>
<tr>
<td>Individual</td>
<td>0.26</td>
<td>0.70</td>
</tr>
<tr>
<td>Drills</td>
<td>7.46</td>
<td>9.80</td>
</tr>
<tr>
<td>Small-Sided Games</td>
<td>13.60</td>
<td>17.22</td>
</tr>
<tr>
<td>Large Games</td>
<td>11.37</td>
<td>12.99</td>
</tr>
</tbody>
</table>
Table 4.

The average time (seconds) and percentage of the training session spent in each coded activity type.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Average Time (Seconds)</th>
<th>Percentage of Training Time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Individual Activity</td>
<td>304.91</td>
<td>310.59</td>
</tr>
<tr>
<td>Drills</td>
<td>711.37</td>
<td>535.88</td>
</tr>
<tr>
<td>SSG</td>
<td>865.00</td>
<td>617.92</td>
</tr>
<tr>
<td>Larger Games</td>
<td>1169.11</td>
<td>840.52</td>
</tr>
<tr>
<td>Transitions</td>
<td>306.09</td>
<td>197.19</td>
</tr>
<tr>
<td>Huddle</td>
<td>465.34</td>
<td>263.78</td>
</tr>
<tr>
<td>Freeze</td>
<td>799.00</td>
<td>413.40</td>
</tr>
<tr>
<td>Drink Break</td>
<td>252.14</td>
<td>128.45</td>
</tr>
</tbody>
</table>