An analysis of practice activities and instructional behaviours used by youth soccer coaches during practice: Exploring the link between science and application

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Abstract
We examined the practice activities and instructional behaviours employed by 25 youth soccer coaches during 70 different practice sessions. We evaluated the extent to which these activities and behaviours differ from those shown in contemporary research to best facilitate skill acquisition. Nine coaches worked with the under-9 years age group and eight coaches each with the under-13 and under-16 years age groups; nine of those coaches were employed at the elite level, nine at the sub-elite level, and seven at the non-elite level. Coaches had players spend more time in activities that were deemed less relevant to soccer match performance, termed “training form” (e.g. physical training, technique and skills practices), than activities deemed more relevant, termed “playing form” (e.g. small-sided/conditioned games and phase of play activities). Coaches provided high levels of instruction, feedback, and management, irrespective of the activity in which players engaged. Few differences in practice activities and instructional behaviours were reported across skill and age groups, implying the absence of any notable age- or skill-related progression. Findings are discussed with reference to recent research in the areas of skill acquisition, motor learning, and expert performance.

Keywords: Coaching behaviours, systematic observation, time-use analysis

Introduction
A major role of coaches is to help athletes acquire the skills necessary to perform successfully in competition. This teaching and learning interface lies at the heart of coaching, which should be considered a pedagogical process (Jones, 2006, 2007). The central components in this teaching and learning interface are the activities in which coaches have their athletes engage in and the instructional behaviours used during these activities. In recent years, there has been much progress in extending our understanding of the science of skill learning and the types of practice activities and instructional behaviours that best develop expert athletes (Farrow, Baker, & McMahon, 2008; Williams & Hodges, 2004, 2005). However, few published reports have focused on how or whether coaches apply these scientific principles in their practices and behaviours. We address this shortcoming by undertaking detailed time-use analysis of practice activities and coaching behaviours in youth soccer and comparing the results with contemporary research findings from the areas of skill acquisition, motor learning, and expert performance.

Some researchers have examined the activities athletes engage in during practice sessions (e.g. Starkes, 2000). Others have used the systematic observation methodology to examine the instructional behaviours employed by coaches during practice sessions (e.g. Cushion & Jones, 2001; Lacy & Darst, 1985). Those who have examined the activities that athletes engaged in during practice sessions have videotaped practice sessions and attempted to categorize the time spent in different activities (e.g. Deakin & Cobley, 2003). This type of analysis examines the microstructure of practice (Starkes, 2000). For example, Deakin, Starkes, and Allard (1998) reported such an analysis of Canadian wrestlers and figure skaters of various skill levels from Olympic to recreational. Negative correlations were reported between the activities athletes deemed most relevant for improving performance and those in which they actually engaged. Although higher...
skilled athletes spent more time on activities deemed most relevant and important for improving performance (e.g. for wrestlers it was sparring/mat work), the time devoted to such activities was relatively low (e.g. only 8.5% of practice time involved sparring/mat work).

In the area of sport pedagogy, there have been numerous attempts using the systematic observation methodology to describe the teaching and instructional behaviours used during coaching (Cushion & Jones, 2001; Douge & Hastie, 1993; Lacy & Darst, 1985; Potrac, Jones, & Armour, 2002). Douge and Hastie (1993) reviewed this research and concluded that effective coaches provide high levels of correction and instruction, provide feedback, use prompts and hustles, use a questioning style, and manage the training environment. In youth soccer, Cushion and Jones (2001) conducted a systematic observation of professional English coaches during practice. Their results generally supported the conclusions of Douge and Hastie (1993), indicating that youth coaches provide high levels of instruction and feedback, as well as praise and silence. Questioning, however, was used infrequently, although the frequency of use was greater for coaches of higher standard.

Although coaching behaviours (e.g. Cushion & Jones, 2001) and practice activities (e.g. Deakin & Cobley, 2003) have been examined in isolation for small cohorts of coaches, no researchers have examined how the use of different coaching behaviours is influenced by the specific practice activity in which athletes engage or by the skill and age of the athletes. Such research is essential since we need to examine what coaches actually do before theorizing about how behaviours may be improved (Potrac, Jones, & Cushion, 2007). In this paper, therefore, we examine what coaches actually do during practice and whether, and if so how, their behaviours differ from those that contemporary researchers have shown to be optimal for skill acquisition. We also investigate the extent to which coaches alter their practice activities and behaviours as a function of the age and skill of players. The practice activities and instructional behaviours employed by 25 youth soccer coaches in England over 70 different practice sessions are examined. The coaches worked with each of three age categories (under-9, under-13, and under-16 years) and three skill levels (elite, sub-elite, and non-elite). We systematically observed these practice sessions and coded practice activities into two broad categories, namely “training form” (i.e. physical training, technique and skills practices) and “playing form” (i.e. phase of play, small-sided/conditioned games). Four different instructional behaviours were coded: instruction; support and encouragement; prolonged silence; and management.

Our hypotheses emanate from research on what coaches actually do during practice sessions (rather than from research showing how practice and instruction should be structured during practice sessions). It has previously been reported (e.g. Starkes, 2000) that athletes spend more time in less relevant activities and less time in more relevant activities. We view this as more time spent in training form activities and less time in playing form activities. However, such research has shown that higher skilled athletes engage in more relevant activities (i.e. playing form) than their less skilled counterparts. Also, traditionally, coaches have made the game easier for young novice learners by using part-practice methods in which opposition (and sometimes team-mates) are removed (i.e. training form). Once players have acquired basic techniques, coaches then provide progression by introducing opposition and more game-like environments (i.e. playing form) (Williams & Hodges, 2005). Consequently, we predict a shift as players’ age and improve in skill, such that progressively less time will be spent in training form than playing form activities. We also expect, based on previous systematic observation research (e.g. Cushion & Jones, 2001), that high levels of instruction are employed during these activities, as well as support and encouragement.

A brief review of research on practice and instruction

A significant lag has been identified between the generation of cutting-edge research evidence and its application in coaching and coach education (Farrow et al., 2008; Williams & Hodges, 2005). We attempt to close this gap by briefly reviewing research evidence from the areas of motor learning, skill acquisition, and expert performance that shows how coaches should structure their practice and instruction to best facilitate skill acquisition. We do so in an attempt to help lay the foundations for a more evidence-based approach to this aspect of coaching.

Practice activities

In terms of the micro-activities in which athletes engage during practice (for a review of the macro-activities that developing athletes should engage in, see Côté, Baker, & Abernethy, 2007), coaches often create part-practice activities to reduce the attention demands of team sports such as soccer. These part-practice activities can involve no opponents (i.e. technique practices) or limited opposition (i.e. skills practices), and in some cases no team-mates, leaving only the player and the ball. In these practices, isolated and pre-determined skills are practised (e.g.
turning with a ball) in a repetitive blocked manner. These “drill-type” practices are based on the view that performance is dependent on the consistent reproduction of a limited number of repeatable motor skills (e.g. passing, dribbling). The presumption is that skills must be broken down into smaller constituent parts during acquisition so as to reduce the demands on attention, rather than practising the skills together as a whole (Lee, Chamberlin, & Hodges, 2001; Schmidt & Lee, 2005). According to this method, once a skill or set of skills has become partially automatic in nature, the demands on the learner may be increased by gradually introducing opponents (i.e. a progressive shift from technique to skills practices). Therefore, traditionally, the implementation of practice activities by coaches has progressed from reliance on drill-type activities towards more match-like activities, such as small-sided games, as the learner becomes older and more skilled (Williams & Hodges, 2005).

In contrast to this traditional view, research has shown that performance in sport, particularly ball games like soccer, is not only dependent on the execution of several motor skills, but also on a number of perceptual-cognitive skills (Williams & Ward, 2007). These perceptual-cognitive skills include the ability to: (a) use the visual system appropriately to extract relevant information from the performance environment; (b) recognize situations in the environment via familiar structure and patterns emerging between players in the game; (c) recognize early or advance information from the postural orientation of an opponent or team-mate in the moments before a key event such as foot-ball contact; (d) develop accurate predictions or probabilities in relation to what actions opponents and team-mates will undertake in a given situation; and (e) make and execute appropriate decisions (Williams & Ford, 2008). These skills are thought to interact continuously in a dynamic manner during performance.

The interaction between perceptual, cognitive, and motor skills observed during match-play is difficult to replicate using the type of part-task practice conditions created in drill-type activities. However, it is essential that this interaction is replicated in the training environment so that players are provided with the opportunity to develop the perceptual, cognitive, and motor skills needed to perform in match-play. The challenge for coaches is how best to recreate match-play conditions while, at the same time, ensuring that the demands on attention are appropriate relative to the age and skill of the learner. In team sports such as soccer, this balance may best be achieved through the use of small-sided/conditioned games where coaches can manipulate the demands on attention by, for example, varying the dimensions of the playing area or the number of players engaging in the activity (e.g. Owen, Twist, & Ford, 2004). Moreover, these activities contain random and variable skill attempts, which have been shown to be better for learning than the blocked and constant structures associated with drill-type activities (Patterson & Lee, 2008; Schmidt & Lee, 2005).

In support of the above arguments, the practice activities that expert athletes regard as being most relevant for improving performance are those closely related to actual performance in competition (Singer & Janelle, 1999). For example, expert wrestlers deem mat-work as the most relevant activity in which they engage (Hodges & Starkes, 1996; Starkes, Deakin, Allard, Hodges, & Hayes, 1996). Law, Côté, and Ericsson (2007) reported that Canadian Olympic rhythmic gymnasts progressively increased the hours engaged in practice activities that were most closely related to performance during their development, such as the training of routines and techniques, whereas less-skilled international gymnasts did not. In soccer, expert players in Belgium rated games and tactical activity as most relevant for improving performance (Helsen, Starkes, & Hodges, 1998), and these types of activities were engaged in more frequently during practice by elite youth players than by recreational players in England (Ward, Hodges, Williams, & Stakes, 2007). In summary, training form type activities may not engage the same perceptual, cognitive, and motor skills as are engaged during a match. In contrast, playing form activities may do so, thereby facilitating the transfer of skills acquired in these practice activities to match-play and ensuring that such activity is more relevant to competitive performance.

**Instruction**

Several researchers have highlighted potential shortcomings with the provision of high levels of instruction and feedback during practice (Williams & Hodges, 2005; Wulf & Shea, 2004). The frequent use of verbal instructions, demonstrations, and feedback can create an overload of information for learners, preventing them from engaging in the problem-solving process. Moreover, its explicit content is easily forgotten and interrupts automatic motor processes, especially when the learner becomes anxious (Jackson & Beilock, 2008; Masters, 2008). An overly prescriptive approach to instruction and feedback can lead to poorer retention and transfer of skill to competition compared with a strategy where verbal instruction, demonstrations, and feedback are provided less frequently (Hodges & Franks, 2004; Wulf & Shea, 2004).
A more “hands-off” approach to instruction has been advocated (for reviews, see Davids, Button, & Bennett, 2008; Handford, Davids, Bennett, & Button, 1997). According to this approach, the role of the coach is to provide opportunities for athletes to engage perceptual, cognitive, and motor skills in the manner they would be used in competition, as well as manipulating the constraints of the practice environment so that players acquire skills through guided discovery rather than explicit instruction. In terms of instruction, the challenge for the coach is to provide the least amount of information necessary for the learner to progress (Williams & Hodges, 2005). In a similar vein, others have shown the value of less prescriptive instructional approaches that promote implicit rather than explicit learning (e.g. Masters, 2000; Masters & Maxwell, 2004) or an external-rather than internal-focus of attention (e.g. Wulf, 2007). Periods of silence by the coach would indicate a less prescriptive approach to the instruction process. The difficulty is that the use of silence has been viewed as either an intentional or unintentional coaching strategy. More experienced or skilled coaches are thought to use silence intentionally so that they can reflect, conduct a number of cognitive processes related to performance, and allow the players the opportunity to learn for themselves and to make their own decisions (Smith & Cushion, 2006). In contrast, the use of silence has also been viewed as an unintentional coaching strategy, indicating a lack of experience or skill (Jones, Housner, & Kornspan, 1995).

Methods

Participants

Altogether, 25 coaches took part in this study from eight soccer clubs. The nine coaches of under-9 players were aged 31.7 ± 8.9 years and all held the Union of European Football Associations (UEFA) B Coaching Licence, apart from one who was undertaking that licence and two who held the UEFA A Coaching Licence. The eight coaches of under-13 players were aged 33.0 ± 5.6 years and all held the UEFA B Coaching Licence, apart from one who was undertaking that licence and two who held the UEFA A Coaching Licence. The eight coaches of under-16 players were aged 38.7 ± 3.5 years and all held the UEFA B Coaching Licence, apart from four who held or were undertaking the UEFA A Coaching Licence. In terms of the skill of the players, nine of those coaches (elite group) were working in the Youth Academy of three professional English Premier League clubs (n = 3 per club), which is the highest level of youth soccer in the UK. Elite coaches were aged 34.3 ± 7.8 years. They all held the UEFA B Coaching Licence; in addition, five held or were undertaking the UEFA A Coaching Licence. Nine of the coaches (sub-elite group) were working in the Centre of Excellence of three professional English Football League clubs (n = 3 per club), which is the second tier of youth soccer in the UK. Sub-elite coaches were aged 36.6 ± 7.3 years. They all held the UEFA B Coaching Licence level; in addition, six held or were undertaking the UEFA A Coaching Licence. Seven of the coaches (non-elite group) worked at two amateur and semi-professional clubs that had achieved The Football Association “Charter Standard”, which is the third tier of youth soccer in the UK. Non-elite coaches were aged 32.6 ± 6.1 years. They all held or were undertaking the UEFA B Coaching Licence; one held the UEFA A Coaching Licence. The research was conducted in accordance with the ethical guidelines of the institution. Participants provided informed consent and were free to withdraw at any time.

Apparatus

The instrument used to collect coaching behaviour data was a modified version of the Arizona State University Observation Instrument, which was originally devised by Lacy and Darst (1985). It was amended using the procedure outlined in Brewer and Jones (2006) to ensure it was relevant to the context in which it was to be used (i.e. youth soccer). The simple hand notation system used to collect time-use data was created using the procedure outlined in Brewer and Jones (2006). This five-stage procedure for establishing valid systematic observation instruments includes: (i) observer training; (ii) amending the existing instrument to demonstrate content validity; (iii) establishing face validity with experts in the domain; (iv) establishing inter-observer reliability; and (v) establishing intra-observer reliability. The lead observer was a qualified youth soccer coach and held the UEFA B Coaching Licence.

Time-use. A simple hand notation system was created for recording the time-use data. For each coaching session, the coach’s name, team, age group, date of session, time the session started, and time the session ended were recorded. To establish the initial content validity and face validity of the notation system, categories of coaching activities were created in consultation with four professional coaches, all of whom held The Football Association Academy Manager’s License. Two of the coaches were Heads at a Premier League Youth Academy (working with elite youth players) and two of the coaches were Head at a School of Excellence (working with
sub-elite youth players). Two main soccer practice activity categories were identified, each of which had three sub-categories. Training form activity was defined as activities practised in isolation or in small groups that did not have a game play context and included: fitness activity (i.e. warm-up, conditioning, and cool-down, all without a ball), technique practice, and skills practice. Playing form activity was defined as activities with a game-related focus and included: phase of play activity, conditioned games, and small-sided games. The sub-activities were considered by the coaches to be representative of all activities that occur in soccer practice sessions. The definitions of these sub-activities are provided in Table I. The type of sub-activity, exact start time of the sub-activity, its duration, and exact end time were recorded using hand notation.

Coaching behaviours. The Arizona State University Observation Instrument has a total of 14 defined behaviours. The observer received training from an expert user of the instrument who was also a performance analyst at a professional soccer club. The training was based on that outlined by Darst, Zakrjasek, and Mancini (1989). To assess the content and face validity of the instrument for the context of youth soccer, we read previous research from systematic observation of coaches (Brewer & Jones, 2006; Cushion & Jones, 2001; Potrac et al., 2002; Smith & Cushion, 2006) and had the four professional coaches examine the instrument to determine whether each category existed in youth soccer in England. The instrument was revised to include only 11 behaviours that represent coaching behaviour in the specific context of youth soccer in England. First, we removed the behaviour “use of first names” because the four professional coaches deemed, and previous researchers (e.g. Cushion & Jones, 2001) have shown, this category to be dependent on other behaviours and also part of other larger behaviours. Second, we removed the behaviour “physical assistance” because the coaches’ deemed, and previous researchers (e.g. Potrac et al., 2002) have shown, that this category is not used in soccer. Third, the coaches’ deemed, and previous researchers (e.g. Smith & Cushion, 2006) have shown, that modelling is used infrequently in soccer coaching, such that there are no time- or frequency-based differences in positive and negative modelling. Therefore, we combined these two behaviours into a single behaviour termed “modelling”. We assigned a number from 1 to 11 to each of the 11 coaching behaviours. The revised instrument was deemed by the four professional coaches to have content and face validity. The revised behavioural categories and their definitions are shown in Table II.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td><strong>Training form</strong></td>
<td><strong>Definition</strong></td>
</tr>
<tr>
<td>Fitness</td>
<td>Improving fitness aspects of the game without a ball (e.g. warm-up, cool down, conditioning, rest)</td>
</tr>
<tr>
<td>Technical</td>
<td>Isolated technical skills unopposed alone or in a group</td>
</tr>
<tr>
<td>Skills</td>
<td>Re-enacting isolated simulated game incidents with or without focus on particular technical skills</td>
</tr>
<tr>
<td><strong>Playing form</strong></td>
<td><strong>Definition</strong></td>
</tr>
<tr>
<td>Small-sided games</td>
<td>Match-play with reduced number of players and two goals</td>
</tr>
<tr>
<td>Conditioned games</td>
<td>As small-sided games, but with variations to rules, goals or areas of play (e.g. possession/ball retention only games, or teams scoring by dribbling ball across end-line)</td>
</tr>
<tr>
<td>Phase of play</td>
<td>Uni-directional match-play towards one goal</td>
</tr>
</tbody>
</table>

Reliability and validity. A pilot study was undertaken to examine the reliability and validity of the modified Arizona State University Observation Instrument and the time-use notation system. Five youth soccer coaching sessions were filmed at one club’s School of Excellence. To examine inter-observer agreement, the lead observer and an independent trained observer, who was also a qualified youth soccer coach and held the UEFA B Licence, watched video of each coaching session alone at separate times during a single week. For intra-observer reliability, the lead observer watched video of each coaching session on two separate occasions. For intra-observer agreement, there was a one-week gap without any access to the recorded sessions between the first and second observation. A one-week gap is recommended (Darst et al., 1989) so as to allow memory lapse to occur. Inter-observer and intra-observer agreement were calculated using the equation: (agreements / (agreements + disagreements)) × 100 (van der Mars, 1989). For time-motion analysis, inter-observer agreement was 98.3% and intra-observer agreement was 97.9%. For coaching behaviours, inter-observer agreement was 94.7% and intra-observer agreement was 93.6%. These figures are in line with the recommendations of previous researchers, who deemed an agreement score of 85% or above to provide suitable reliability (Rushall, 1977; van der Mars, 1989).

Procedure

The coaching sessions took place at each club’s training ground. The sessions were recorded using a digital video camera (Canon XM2, Amstelveen,
Table II. Coaching behaviour categories and definitions.

<table>
<thead>
<tr>
<th>Behaviour</th>
<th>Definition</th>
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<tbody>
<tr>
<td><strong>Instruction</strong></td>
<td><strong>Definition</strong></td>
</tr>
<tr>
<td>Pre-instruction</td>
<td>Initial information given to a player(s) preceding the desired action to be executed. Used to explain how to execute a skill, play, assignment, strategy, and so forth.</td>
</tr>
<tr>
<td>Concurrent instruction</td>
<td>Cues or reminders given to a player(s) during the actual execution of the skill or play.</td>
</tr>
<tr>
<td>Post-instruction</td>
<td>Correction, re-explanation or instructional feedback given after the execution of a skill or play.</td>
</tr>
<tr>
<td>Questioning</td>
<td>Any question to a player(s) concerning strategies, techniques, assignments, and so forth.</td>
</tr>
<tr>
<td>Modelling</td>
<td>Provision of a demonstration of correct or incorrect performance of a skill or playing technique.</td>
</tr>
<tr>
<td><strong>Support and encouragement</strong></td>
<td><strong>Definition</strong></td>
</tr>
<tr>
<td>Scold</td>
<td>Verbal or non-verbal compliments, statements or signs of acceptance expressed towards the player(s).</td>
</tr>
<tr>
<td>Praise</td>
<td>Verbal or non-verbal compliments, statements or signs of displeasure expressed towards the player(s).</td>
</tr>
<tr>
<td>Hustle</td>
<td>Verbal or non-verbal statements intended to intensify the efforts of the player(s).</td>
</tr>
<tr>
<td>Silence</td>
<td>Deliberate period of time when the coach is not talking. Deliberate period constitutes a period of silence for 5 s.</td>
</tr>
<tr>
<td>Management</td>
<td>Verbal statements related to the organizational details of practice sessions, not referring to strategies or skills.</td>
</tr>
<tr>
<td>Uncoded</td>
<td>Any behaviour that cannot be seen or heard or does not fit into the above categories.</td>
</tr>
</tbody>
</table>

Netherlands) mounted on a stationary tripod (Libec, Arizona, USA). The camera was positioned 10 m from the edge of the coaching area, so as to track the movements of players and coach. The coaches all wore a head-set microphone (Sennheiser EW3 Super Cardial Head-Mic, Germany) and a hip-mounted radio transmitter (Sennheiser SK100G2, Germany), which was connected to the head-set. The radio transmitter sent a signal to a radio receiver (Sennheiser EK100G2, Germany), which was connected and mounted to the camera, enabling voice and visual signals to be recorded simultaneously. All data were gathered over a 3-month period in the middle of the competitive season.

At each club, we filmed three practice sessions for the coach working with the under-9, under-13, and under-16 years age group respectively. We were unable to film eleven coaching sessions for the non-elite group. This comprised three under-9 sessions, four under-13 sessions, and four under-16 sessions. Therefore, we had a total of 16 coaching sessions for this skill group. Altogether, 70 different coaching sessions were recorded across the different age and skill groups. The video footage of each coaching session was transferred to DVD and analysed using a laptop computer (Compaq Presario V2000, California) and DVD software (InterVideo WinDVD 7, California). The practice activities were analysed using a continuous recording method (Darst et al., 1989). An investigator notated the start and end time of each activity on the hand-notation sheet. This process was repeated until all coaching sessions had been analysed.

Coach behaviours were recorded using the time sampled event method (Rushall, 1977). When a predefined coaching behaviour was first exhibited by the coach during practice, the investigator recorded the assigned coaching behaviour number (see Table II) onto the Arizona State University Observation Instrument coding sheet. When a coaching behaviour lasted more than 5 s, the investigator recorded a dash (–) next to this number. The dash indicated that the behaviour was a continuation of the previous behaviour, rather than a new one. A new dash was added for every 5 s that elapsed during the coaching behaviour. When the coach exhibited a 5-s silence, this was recorded as a period of prolonged silence, with a dash being added for every subsequent 5 s of silence. When another predefined coaching behaviour was exhibited by the coach, the assigned number for this coaching behaviour was entered onto the coding sheet and the process repeated. This method allowed data to be analysed with regard to the frequency of specific events (i.e. event recording) and the times spent in each behaviour (i.e. interval recording) (Cushion & Jones, 2001).

Data analyses

Time-use analyses. The duration of each coaching session was analysed using analysis of variance (ANOVA) with skill and age as the two between-group factors. Statistical significance was set at \( P < 0.05 \). Any significant main effects were followed up with pairwise comparisons. The Bonferroni correction method was used to adjust the alpha level required for significance for these post-hoc pairwise comparisons only. The effect size measures involving more than two means were calculated using the Cohen’s \( f \) formula (Cohen, 1988).

The data for time-use analysis violated the statistical assumption of independence, which holds that one data point should not influence another (Field, 2005). For example, within a fixed period, such as a coaching session, when a large amount of time is spent in activity A, then only a small amount of time is available for activity B.
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can be spent in activity B. We were therefore unable to run inferential statistics on these data. Descriptive statistics were calculated. Coaching sessions varied in length, so we calculated the percentage of session duration that the players spent in the two main forms of activities: playing form and training form activities. Percentage of session duration was calculated by dividing the time spent in one of the activities by the total time for the coaching session, and then multiplying this number by 100. Additional descriptive statistics were calculated for the percentage of training form time spent in each of its three sub-activities and the percentage of playing form time spent in each of its three sub-activities.

Coach behaviours. We combined several coach behaviours into categories for analysis. First, the behaviours praise, scold, and hustle were combined into a category called “support and encouragement” (Smith & Cushion, 2006). Second, the behaviours pre-instruction, post-instruction, concurrent instruction, modelling, and questioning were combined into a category termed “instruction”. We also analysed the behaviours “management” and “prolonged silence”. The main dependent variable was rate per minute for each behaviour category. We did not use the frequency of behaviours as the main dependent variable because this variable was positively correlated to the session duration (e.g. longer sessions usually have a higher frequency of behaviour, which confounds the use of frequency as the dependent variable). However, we calculated descriptive statistics for frequency of behaviours expressed as: (i) frequency and (ii) percentage of total behaviours in a session. Percentages were calculated by dividing each independent behaviour category by the total number of behaviours (Lacy & Darst, 1985). The behaviour “uncoded” was included in this calculation. We also calculated descriptive statistics for the time intervals spent in a coaching behaviour, which was calculated by adding up the number of 5-s elapses of a coaching behaviour in a session. A coaching behaviour less than 5 s was included as one interval. The behaviour “uncoded” was included in this calculation.

Separate factorial ANOVAs were used to analyse the rate per minute of coaching behaviours separately for both playing form and training form data sets, with skill (elite, sub-elite, non-elite) and age (under-9, under-13, under-16 years) as the between-participants factors and coaching behaviour (Instruction, Support and Encouragement, Management, Prolonged Silence) as the within-participants factor. Violations of sphericity were corrected using Greenhouse-Geisser procedures. Any significant main effects were followed up with pairwise comparisons. The Bonferroni correction method was used to adjust the alpha level required for significance for post-hoc pairwise comparisons only. The effect size measures involving two means were calculated using the Cohen’s $d$ formula (Cohen, 1988). These measures were calculated using pooled standard deviations. The effect size measures involving more than two means were calculated using the Cohen’s $f$ formula (Cohen, 1988). Skill, age, and interaction effects were followed up with Tukey HSD post-hoc procedures. Statistical significance for all tests was set at $P < 0.05$.

Results

Session duration

The average session duration was 78 ± 19 min. There was a significant difference between skill groups ($F_{2,68} = 16.70$, $P < 0.05$, $f = 0.2$). Post-hoc tests revealed that the average session duration was significantly longer for the elite (89 ± 14 min) and sub-elite (86 ± 20 min) groups than the non-elite group (59 ± 8 min). Session durations were not significantly different across the three age groups and there was no skill × age interaction ($P$s < 1).

Time-use analyses

Since session duration differed across skill groups, percentage of session duration was used as the primary dependent variable. Figure 1 shows the percentage of session duration spent in training form and playing form activities as a function of age and skill. Overall, the percentage of session time spent in training form and playing form activities was 65 ± 20% and 35 ± 20%, respectively. Percentage of session duration spent in training form activities was 60 ± 20% for the elite teams, 65 ± 22% for the sub-elite teams, and 72 ± 15% for the non-elite teams. Therefore, the percentage of session duration spent in playing form activities was 40 ± 20% for the elite teams, 35 ± 22% for the sub-elite teams, and 28 ± 15% for the non-elite teams. Percentage of session duration spent in training form activities was 69 ± 19% for the under-9 teams, 58 ± 17% for the under-13 teams, and 66 ± 23% for the under-16 teams. Therefore, the percentage of session duration spent in playing form activities was 31 ± 19% for the under-9 teams, 42 ± 17% for the under-13 teams, and 34 ± 23% for the under-16 groups.

Training form activity. All teams took part in each of the three training form activities: fitness activity, technique practice, and skills practice. Percentage of session time spent in fitness activity was 29 ± 10% for the elite teams, 23 ± 11% for the sub-elite teams, and 19 ± 8% for the non-elite teams. Percentage of session time spent in technique practice was 21 ± 13% for the elite teams, 25 ± 19% for the
sub-elite teams, and 36 ± 15% for the non-elite teams. Regardless of age, percentage of session time spent in skills practice was 14%, whereas percentages of session time spent in fitness activity and technique practice were both 25%.

Playing form activity. Four sessions contained no playing form activity (one elite, under-16; one elite, under-9; two sub-elite, under-16). With some exceptions, all skill and age groups took part in each of the three playing form activities: phase of play activity, conditioned games, and small-sided games. Phase of play activity was not engaged in by all under-9, under-13 sub-elite, and under-16 non-elite teams. Conditioned games were not engaged in by the under-9 non-elite teams. Percentage of session time spent in conditioned games was 24 ± 17% for the elite teams, 11 ± 15% for the sub-elite teams, and 9 ± 13% for the non-elite teams. Percentage of session time spent in small-sided games was 13 ± 15% for the elite teams, and 18 ± 13% for both the sub-elite and non-elite teams. Percentage of session time spent in small-sided games was 15%, 20%, and 13% for the under-9, under-13, and under-16 team, respectively. Percentage of session time spent in conditioned games was 15%, 18%, and 13% for the under-9, under-13, and under-16 team, respectively.

Coaching behaviours

Table III shows the frequency, rate per minute, percentage of all coaching behaviours, and time intervals of the coaching behaviour categories as a function of skill and age across the two activity forms.

Training form activity. The rate per minute of coaching behaviours in training form activities did not differentiate the skill groups ($F_{2,59} = 2.08, P > 0.05, f = 0.27$). Rate per minute of coach behaviours in training form activities did differentiate age groups ($F_{2,59} = 3.87, P < 0.05, f = 0.36$). Rate per minute of coach behaviours in training form activities was higher for the under-16 group than the under-13 group, but not the under-9 group. The skill x age interaction was not significant ($F < 1$). There was a significant main effect for behaviour ($F_{2.06,121.31} = 20.57, P < 0.05, f = 0.59$). Rate per minute of prolonged silence (which had to be 5 s in duration to be recorded) in training form activities was lower than that of the other three behaviours. Prolonged silence behaviour during training form activities across age and skill groups included relatively longer bouts of that behaviour (e.g. above 10 s), as indicated by the frequencies being much lower than the intervals. Also, the rate per minute of instruction behaviour in training form activities was higher than that for management. Regardless of skill level, the percentage of all coach behaviours during training form activities was as follows: instruction 30 ± 10%; support and encouragement 27 ± 13%; prolonged silence 16 ± 11%; and management behaviour 24 ± 8%.

The skill x behaviour interaction was significant ($F_{4.11,121.31} = 3.11, P < 0.05, f = 0.46$). Rate per minute of support and encouragement behaviour during training form activities was higher for the elite group (34 ± 14%) than for the other two skill groups (24 ± 9%), whereas there was no difference between groups across the other behaviours. Support and encouragement behaviours during training form activities for the sub-elite and non-elite groups comprised many short bouts of that behaviour, as indicated by the frequencies (105 and 104 times, respectively) being very similar to the intervals (125 and 119 times, respectively). In comparison, the elite group had some longer bouts of support and encouragement behaviour, as indicated by the frequencies of that behaviour (154 times) being slightly lower than the intervals (204 times).
Table III. Frequency, rate per minute (RPM), percentage of total behaviours, and intervals for the coaching behaviours (instruction, support and encouragement, management, prolonged silence) as a function of activity, skill, and age (mean ± s).

<table>
<thead>
<tr>
<th></th>
<th>Instruction</th>
<th>Support and encouragement</th>
<th>Management</th>
<th>Prolonged silence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freq.</td>
<td>RPM</td>
<td>%</td>
<td>Interval</td>
<td>Freq.</td>
</tr>
<tr>
<td><strong>Training form (Skill)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elite</td>
<td>130 ± 79</td>
<td>1.57</td>
<td>31 ± 9</td>
<td>170 ± 94</td>
</tr>
<tr>
<td>Sub-elite</td>
<td>136 ± 94</td>
<td>1.60</td>
<td>31 ± 11</td>
<td>150 ± 101</td>
</tr>
<tr>
<td>Non-elite</td>
<td>114 ± 59</td>
<td>1.89</td>
<td>26 ± 6</td>
<td>110 ± 69</td>
</tr>
<tr>
<td><strong>Playing form (Skill)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elite</td>
<td>159 ± 78</td>
<td>1.78</td>
<td>24 ± 9</td>
<td>168 ± 92</td>
</tr>
<tr>
<td>Sub-elite</td>
<td>119 ± 101</td>
<td>1.39</td>
<td>31 ± 11</td>
<td>118 ± 92</td>
</tr>
<tr>
<td>Non-elite</td>
<td>72 ± 50</td>
<td>1.19</td>
<td>29 ± 10</td>
<td>67 ± 51</td>
</tr>
<tr>
<td><strong>Playing form (Age)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Under-9</td>
<td>157 ± 82</td>
<td>2.04</td>
<td>36 ± 8</td>
<td>145 ± 94</td>
</tr>
<tr>
<td>Under-13</td>
<td>108 ± 80</td>
<td>1.29</td>
<td>28 ± 10</td>
<td>128 ± 100</td>
</tr>
<tr>
<td>Under-16</td>
<td>132 ± 75</td>
<td>1.66</td>
<td>25 ± 8</td>
<td>171 ± 86</td>
</tr>
</tbody>
</table>

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Playing form activity. The rate per minute of coach behaviours in playing form activities differentiated skill groups \( (F_{2,57} = 5.25, P < 0.05, f = 0.43) \). The elite group recorded a higher rate per minute of behaviours in playing form activities than the other two skill groups. Rate per minute of coach behaviours in playing form activities was higher for the under-16 than the under-9 group, but not the under-13 group. The skill \( \times \) age interaction was not significant \( (F_{4,57} = 1.70, P > 0.05, f = 0.48) \). There was a significant main effect for behaviour \( (F_{2,1,125.97} = 7.34, P < 0.05, f = 0.36) \). Rate per minute of instructional behaviour in playing form activities was higher than that of the other three behaviour categories. Irrespective of skill level, the percentage of all coach behaviours during playing form activities that were instruction behaviour was 30 ± 8%.

The skill \( \times \) behaviour interaction was significant \( (F_{4.42,125.97} = 4.63, P < 0.05, f = 0.58) \). Rate per minute of support and encouragement behaviour for the elite group was higher than for the other two skill groups, whereas there was no between-group differences across the other three behaviours. The percentage of all coach behaviours that were support and encouragement during playing form activities was 29 ± 12% for the elite group, 18 ± 10% for the sub-elite group, and 20 ± 9% for the non-elite group. Support and encouragement behaviours during playing form activities across groups comprised many short bouts of that behaviour, as indicated by the frequency (99 times) of that behaviour being the same as the interval (99 times). The age \( \times \) behaviour interaction was also significant \( (F_{4.42,125.97} = 8.83, P < 0.05, f = 0.53) \). Rate per minute of prolonged silence was higher for the under-16 group than the other two age groups, whereas there were no between-group differences across the other behaviours. For the under-9, under-13, and under-16 groups, prolonged silence behaviour accounted for 18 ± 14%, 20 ± 7%, and 34 ± 13% of all coach behaviours, respectively. No other interactions reached significance.

Discussion

We examined the activities that soccer coaches had their players engage in during practice sessions and the nature of the instructional behaviours that took place during these activities. Also, we were interested in how the activities and instructional behaviours employed by coaches differ based on the age and skill of the players taking part in the practice session. Based on previous research of practice activities (e.g. Hodges & Starkes, 1996; Law et al., 2007) and our knowledge of traditional coaching methods (Williams & Hodges, 2005), we predicted that players would spend more time in less relevant training form activities than more relevant playing form activities, but that this difference would interact with the age and skill of the players. Based on previous systematic observation research (e.g. Cushion & Jones, 2001), we also anticipated that high levels of instruction would be employed during these activities, as well as support and encouragement.

As predicted, the coaches had their players engage in more training form than playing form activities. On average across groups, 65% of practice time was spent in training form activities versus 35% in playing form activities. We deemed playing form activities to be more relevant to performance in soccer compared to training form activities. Our findings support previous studies in which researchers (e.g. Deakin & Cobley, 2003) examined what athletes actually do during practice sessions. Deakin et al. (1998) examined the microstructure of practice for Canadian wrestlers and figure skaters of various skill levels. They also found that athletes spent less time on highly relevant activities and more time on activities of less relevance. The finding that players only engage in more relevant activities (i.e. playing form activities) for around a third of total practice time is rather worrying. A conservative view would suggest that more practice time should be spent in playing form than training form activities, whereas a more radical view would be that only playing form activities should be employed (Williams & Hodges, 2005). Moreover, the links between perceptual, cognitive, and motor skills appear to be set to some degree in the early stages of development (e.g. Proteau, Marteniuk, Girouard, & Dugas, 1987; Proteau, Marteniuk, & Lévesque, 1992), so it is especially important that younger and novice players are exposed to playing form activities, which create the skills and links between the skills that they will need to perform in a match.

The proportions of time spent in playing form and training form activities did not differ as a function of the age or skill of the players engaging in practice. Although there was a trend towards coaches favouring a higher proportion of playing form activities with more skilled players, and to a lesser extent with older age groups, training form activities remained dominant across all skill and age groups. Deakin et al. (1998) also found this limited progression across age
and skill. Their higher skilled wrestlers and figure skaters spent more time on activities deemed most relevant and important for improving performance (e.g., for wrestlers it was sparring/mat work), although the actual time devoted to such activities remained relatively low (only 8.5% of practice time involved sparring/mat work). However, Ward et al. (2007) found that elite youth soccer players engaged in more of the tactical and decision-making activities associated with playing form activities compared to recreational players. In contrast, we found limited progression in relation to the nature of the practice activities used by coaches with older and more skilled players. The only difference between skill groups was that the non-elite group had significantly shorter session duration than the elite and sub-elite groups.

We also examined the nature of the coaching behaviours employed by coaches during the activities. The most frequently used coach behaviour was instruction, supporting previous systematic observation research in soccer (e.g., Cushion & Jones, 2001). However, the amount of instruction in the present study (30%) was lower than that reported previously by Cushion and Jones (2001, 50%), although in the present study the percentage of management behaviour (24%) was higher than that (3%) reported by Cushion and Jones (2001). Although the provision of instruction and management is an essential component of the coaching process, recent empirical work has highlighted the dangers involved in being overly prescriptive and in using these behaviours too frequently during practice (Davids et al., 2008; Williams & Hodges, 2005). At some stage, usually in competition, learners have to perform on their own without direct guidance and instruction from coaches. Consequently, the challenge for coaches is to provide the least amount of instruction possible so as to enable athletes to solve problems independently regardless of the athlete’s age or skill.

We also examined the extent to which the coaching behaviours were influenced by the age and skill of the players involved. The elite group were exposed to a greater frequency of coaching behaviours in playing form activities, but no skill-based differences were evident in the training form category. The interaction between skill and behaviour for playing form activities indicated that coaches working with elite players provided more support and encouragement than those working with sub-elite and non-elite players. The elite youth soccer coaches studied by Cushion and Jones (2001) also provided relatively high levels of support and encouragement in the form of praise. The main differences as a function of age was that coaches working with the under-16 age group displayed a higher frequency of coaching behaviours than those working with the under-9 and under-13 age groups, although this was dependent on the type of activity. In line with our observations on the nature of the practice activities undertaken, there were very few differences in coaching behaviour as a function of the age and skill of the players being coached. It appears that the coaches did not alter their instructional behaviours greatly based on the age and skill of their players.

Our findings illustrate the lag between research and its application in coaching and coach education (Farrow et al., 2008). Contemporary research in the areas of skill acquisition, motor learning, and expert performance highlight the advantage of using practice activities that are highly relevant to performance and that recreate the perceptual, cognitive, and motor demands of competition, coupled with a more “hands-off” approach to instruction. We would view this as more time spent in playing form activities and a lower frequency of instructional behaviours. In contrast, the data show that players spent the majority of their time engaging in less relevant training form activities that did not replicate particularly well the demands of competition, whereas at the same time the coaches spent most of their time providing explicit instruction and management. When acquiring and designing practice activities and instruction behaviours, coaches tend to rely on emulation of other coaches, their own intuition, and the traditions of the sport and club, rather than on evidence-based research findings (Williams & Hodges, 2005). Moreover, research from a sociological perspective (e.g., d’Arripe-Longueville, Fournier, & Dubois, 1998) has shown that the expectations of several parties (e.g., athletes, other coaches, managers, parents of athletes) and the context the coaching occurs in can cause the coach to behave in certain ways, which might not match scientific evidence showing what coaches should do in that context.

Study limitations

The present study has a number of limitations. First, recent advances in the research examining coach behaviours have included a qualitative component assessing “why” the coaches have used certain behaviours (e.g., Cushion & Jones, 2001). Although this additional method would have added to our study, we felt it was beyond the scope of this research. However, in future researchers may consider why coaches used the activities and behaviours they did. Second, although the sample size employed was much larger than used in previous studies, it was still relatively low. Consequently, a lack of statistical power may be evident when analysing coach behaviours. Third, a number of potential confounding
factors have not been addressed in this study, such as variability in the quality of play during practice, the quality of instruction provided, and the skill, style, and philosophy of the coaches.

Practical implications

Our findings contradict those reported in contemporary research in the areas of skill acquisition, motor learning, and expert performance. In this study, players spent more time in activities that were deemed less relevant to soccer match performance (i.e. training form activities: physical training, technique practice, and skills practice) than activities deemed more relevant (i.e. playing form activities: small-sided/conditioned games and phase of play activities). Coaches also provided high levels of instruction, management, and feedback, irrespective of the activity. Scientists (e.g. Williams & Hodges, 2005) have highlighted the advantage of using practice activities that are highly relevant to performance in that they recreate the perceptual, cognitive, and motor demands evident during competition, coupled with a less prescriptive approach to instruction. To this end, small-sided and conditioned games in all their various formats (e.g. 2 vs. 1, 4 vs. 4) and guises (e.g. two goals placed at ends of each goal line) are suitable. Training form activities are more likely to only train the motor skills of players, whereas successful match performance requires players to use perceptual, cognitive, and motor skills simultaneously during performance. It is possible to adapt training form activities so that they more realistically recreate the demands evident during competition, although this type of activity was not evident in our data. The key to this adaptation is that the activity requires that players make match-like decisions themselves based on the positioning and movements of opponents, team-mates and the ball, as well as the availability of space. Coach educators have a role to play in closing the gap between research and practice by disseminating through education courses up-to-date and applicable research findings from the areas of skill acquisition, motor learning, and expert performance.

Summary

In summary, we examined the practice activities and instructional behaviours employed by coaches working with youth soccer players in England. Players spent more time in activities that were deemed less relevant (i.e. training form activities) to match performance than those viewed as being more relevant (i.e. playing form activities). We also found that coaches provided high levels of instruction, management, and feedback during these activities.

Our findings contradict those reported in contemporary research in the areas of skill acquisition, motor learning, and expert performance and highlight a potential gap between science and practice in the coaching of youth soccer players.

References


