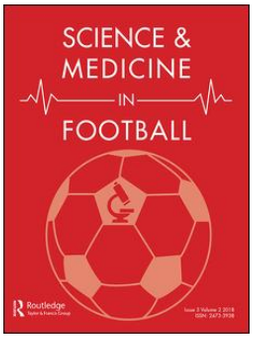

Routledge
Taylor & Francis Group

Science and Medicine in Football

ISSN: 2473-3938 (Print) 2473-4446 (Online) Journal homepage: https://www.tandfonline.com/loi/rsmf20

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To cite this article: André Roca & Paul R. Ford (2020): Decision-making practice during coaching sessions in elite youth football across European countries, Science and Medicine in Football, DOI: 10.1080/24733938.2020.1755051

To link to this article: https://doi.org/10.1080/24733938.2020.1755051

Accepted author version posted online: 09 Apr 2020.

Publisher: Taylor & Francis & Informa UK Limited, trading as Taylor & Francis Group

Journal: *Science and Medicine in Football*

DOI: 10.1080/24733938.2020.1755051

Decision-making practice during coaching sessions in elite youth football across European countries

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Abstract

We examined the practice activities employed by 53 youth football coaches working in youth academy professional top-division clubs from England, Germany, Portugal, and Spain. This is the first study to explore the microstructure of coach-led practice in elite youth football across multiple countries. A total of 83 practice sessions from under-12 to under-16 age groups were collected in situ. Sessions were analysed for the proportion of time in 'non-active decision-making' (e.g., unopposed technical or tactical skills practices, fitness training) and 'active decision-making' activities (e.g., small-sided games, skills practice with opposition), with the latter deemed superior for the transfer of game intelligence skill to match play. More time was spent in active decision-making (*M* = 62%) compared to non-active decision-making activities (*M* = 20%) and transitioning between activities (*M* = 17%). Players from Portugal and Spain spent a higher amount of time in active decision-making activities compared to English and German players, whereas, English players spent more time in unopposed technical-based drills and German players in improving fitness aspects of the game without the ball. Findings extend previous research assessing coach-led youth football practice in single countries by demonstrating differences in training activities between countries in Europe.

Keywords: *skill acquisition, perceptual-cognitive expertise, representative learning design, soccer, systematic observation*

Introduction

Researchers in motor learning have assessed the importance of practice structure on skill acquisition during training (e.g., Barreiros, Figueiredo, & Godinho, 2007; Broadbent, Causer, Ford, & Williams, 2015; Goode, & Magill, 1986; Shea & Morgan, 1979). This work addresses a critical question for coaches and practitioners of how practice environments and activities should be designed to best facilitate the learning and acquisition of expert performance. A key performance attribute that has been consistently shown to discriminate high-skilled football players from their less-skilled counterparts is the ability to anticipate and make effective decisions under pressure during match play (e.g., Roca, Ford, McRobert, & Williams, 2011, 2013; Vaeyens, Lenoir, Williams, Mazyn, & Philippaerts, 2007; Williams & Davids, 1998). Research evidence has suggested that these 'game intelligence' skills are primarily acquired through activities in which practice has the same underlying structure as competition (e.g., Miller et al., 2017; Roca, Williams, & Ford, 2012; Vickers, 2007; Williams, & Ford, 2013). That is, the conditions in practice are said to be effective to the extent that they engage processing demands (i.e., visual search, recognition, decision making) for the player that are the same as required in the transfer environment (i.e., competition) (e.g., transfer-appropriate processing, Schmidt & Lee, 2011). Therefore, the main goal of coaching practice is for players to acquire skill that transfers to improved performance in the competition format through the design of representative practice environments that simulate the demands of that format (Pinder, Davids, Renshaw, & Araújo, 2011).

The traditional approach to coaching young athletes is characterised by reducing the demands of the game for learners through multiple repetitions of a single skill with no opponents in order to acquire motor skill (Ford & Williams, 2013; Renshaw, Davids,

Shuttleworth, & Chow, 2009). Although these drill-type activities with no active decision making for players (also referred to as 'training form' activities, Ford, Yates, & Williams, 2010) may produce better performance in practice, they are unlikely to promote positive transfer of game intelligence skills from practice to competition and will in the long-term impose artificial constraints even on motor learning, producing temporary, inappropriate and inefficient movement solutions (Davids, Button, & Bennett, 2008). The 'constraints-led' approach (Davids et al., 2008) provides a relevant framework for designing and creating optimal learning environments for effective skill acquisition and transfer. According to this approach, what is important in practice is the interactive relationship between the learner and the specific constraints imposed by the practice environment. The constraints in practice need to adequately replicate competition conditions (i.e., match play) in order to increase transfer of skill acquisition. One method for coaches is to manipulate the constraints of practice by using active decision-making activities (also referred to as 'playing form' activities, Ford et al., 2010) in order for this transfer to occur, such as by manipulating the rules of small-sided games.

Coaching itself is context-specific (e.g., Cushion, Armour, & Jones, 2006), with differences in coaching practice thereby expected between countries and regions around the world, partly as a consequence of differences between countries in coach education (ICCE, 2012). Yet, no published research exists assessing the microstructure of coach-led practice across a wider sample of countries and regions. A number of researchers have examined the structure of the practice activities engaged by elite youth football players during coaching sessions in single countries, mostly in England (e.g., Ford et al., 2010; Ford & Whelan, 2016; Partington & Cushion, 2013) and Australia (O'Connor, Larkin, & Williams, 2018). In early studies with English elite youth football teams (e.g.,

Ford et al., 2010; Partington & Cushion, 2013), participants were shown to spend more time in non-active decision making (i.e., coach pre-determines the decisions for players when engaging in the practice) compared to active decision-making activities (i.e., player makes decisions based on variation in opponent and teammate movements). For example, Ford et al. (2010) analysed the practice activities used by 25 youth football coaches during 70 coaching sessions of child and adolescent in England across different skill levels. Coaches had players engage in non-active decision-making drill-based activity for 65% of session time with the remaining 35% spent in active decision-making games-based activity. Similarly, Partington and Cushion (2013) investigated the practice activities and coaching behaviours of professional youth football coaches working within an English Football Association Premier League academy (under-10 to under-15/16 age groups). Again, coaches scheduled more non-active decision-making drill-based activities than active decision-making game-based activities (53% vs. 47%, respectively).

In more recent studies, the practice activities engaged by youth football teams from England (Ford & Whelan, 2016) and Australia (O'Connor et al., 2018) have contained greater amount of game-based compared with drill-based activities. O'Connor et al. (2018) explored the structure of football coaching sessions used by 34 youth football coaches working with under-11 to under-17 club-level players in Australia. Players spent 41% of session time in games-based activity and 22% in drill-based activities. Ford and Whelan (2016) assessed practice activities of four youth football teams from each of three professional clubs in England. The coaching sessions contained 60% of games-based activity, 21% of drill-based activity and the remaining time spent in transition between activities. Game-based activities that include active decision making for the players as found in the full version of the sport are predicted to

elicit greater improvements in the ability for players to use visual search and scanning and make accurate decisions during competition compared to drill-based practices (Ford, 2016; Ford & O'Connor, 2019; Ford & Whelan, 2016; Low, Williams, McRobert, & Ford, 2013). This more recent increase in the use of game-based activities over drill-based to improve young players' decision-making skills, might be linked to recent changes and revisions to coach education courses and guidelines on player skill acquisition in those countries (Ford & Whelan, 2016). O'Connor, Larkin, and Williams (2017) explored the strategies youth football coaches in Australia used to create learning environments they believed develop players' decision making. Findings suggested that coaches seem aware of strategies that promote decision-making opportunities for players including constraints-led pedagogy and playing form activities. Yet, they found there is still limited correspondence between intent and practice, with the use of game-based learning approaches still a challenge to implement for coaches. Although a number of research studies have examined the structure of the practice activities engaged by elite youth football players during coaching sessions, these have only focused in single country systems and contexts. Further research is needed to enable direct comparison of coaching contexts from a wider sample of countries, other than the UK and Australia.

The aim of this study is to investigate the types of practice activities used by coaches of elite youth players across European countries. The idea was to provide a representative picture of coach-led practice environments within some of the top European football nations. A total of 53 male coaches working across 16 different Youth Academy professional top division clubs from England, Germany, Portugal, and Spain participated. This included the analysis of 83 practice sessions collected in situ (i.e., on the premises where the sessions took place) from boys under-12 to under-16

age groups. The analysis in this study examined the specific types of practice activities used during the coaching sessions that incorporate, or not, an active match-like decision-making component for players (Ford & Whelan, 2016).

Methods

Participants

Altogether, 53 male football coaches working with boys under-12 to under-16 age groups within 16 Youth Academy professional top-division clubs of four European nations took part in this study. Fifteen coaches from England were aged 33 ± 7 years (mean ± SD) and held the Union of European Football Associations (UEFA) B (*n* = 10) and UEFA A (*n* = 5) Coaching Licences. The 14 coaches from Germany were aged 34 ± 7 years and held the UEFA B (*n* = 8), UEFA A (*n* = 4), and UEFA PRO (*n* = 2) Coaching Licences. The 11 coaches from Portugal were aged 32 ± 5 years and held the UEFA B (*n* = 6) and UEFA A (*n* = 5) Coaching Licences. Finally, 13 coaches from Spain were aged 33 ± 7 years and held the UEFA B (*n* = 6), UEFA A (*n* = 5), and UEFA PRO (*n* = 2) Coaching Licences. Ethical approval was obtained from the lead institution's research ethics committee with informed consent provided by the clubs and coaches that participated.

Procedure

The coaching sessions took place at each club's academy training ground. A total of 83 practice sessions from under-12 to under-16 age groups were assessed, including 20 sessions (U12 = 6; U13 = 4; U14 = 4; U15 = 5; U16 = 1) for four English clubs, 21 sessions (U12 = 7; U13 = 3; U14 = 4; U15 = 2; U16 = 5) for four German clubs, 22 sessions (U12 = 5; U13 = 4; U14 = 5; U15 = 8; U16 = 0) for four Portuguese clubs, and 20 sessions (U12 = 4; U13 = 4; U14 = 6; U15 = 3; U16 = 3) for four Spanish clubs. A simple hand-notation system was used to collect in situ time-use data for every

coaching session. The exact data recorded for each session included the coach's name, team, age group, date of session, exact time each type of (sub-) activity started and ended as well as transition periods (e.g., gaps between practice activities). The lead-observer was a qualified youth football coach and held the UEFA A Coaching Licence. The categorisation system employed to classify the different session's practice activities was adapted from that used by Ford and Whelan (2016). Table I shows detailed definitions of the activities analysed.

Two main football practice activity categories were used called *active decision-making* and *non-active decision making*. Active decision-making activity was defined as activities practised in small groups or teams that contain active decision-making for the players that is the same or similar to the full version of the football game. Active decision making consisted of five sub-activities of skills practice (active with at least some opposition), uni-directional games, small-sided and conditioned games, possession games, and phase of play. Non-active decision-making activity was defined as activities that do not contain the active decision making found in the full version of the game for the players (e.g., isolated technical skills unopposed). Non-active decision-making activity consisted of three sub-activities of fitness (e.g., warm-up, cool down, conditioning), technical, and skills (non-active with no or overly constrained opposition at least). The sub-activities have been shown in previous research (e.g., Ford et al., 2010) to cover all activities in youth football coaching sessions. Sub-activities were recorded in situ and the categorisation into the main types of activity (e.g., active decision making) occurred after the sessions. The gaps between practice activities in which players were either moving between activities, taking drink breaks, or listening to the coach prior to the activity physically starting or after it ends were placed into a category called 'transition'. The data were collected over a time period spanning two

seasons between 2016 and 2018 in the middle of the competition season and of a typical weekly training schedule (i.e., none of the sessions recorded were preceded or followed by a competitive match, e.g., recovery or match-preparation sessions).

Insert Table 1 about here

Inter- and intra-observer reliability

To examine inter-observer agreement, the lead observer and an independent trained observer, who was also a qualified football coach and held a UEFA B Licence, collected time-use data for nine practice sessions in situ during a period of a week. For intra-observer reliability, the lead observer used the categorisation system (e.g., active decision making etc.) to (re-)classify the practice activities for nine randomly selected practice sessions on two separate occasions, with a one-week gap between the observations in order to allow memory lapse to occur (Darst, Zakrajsek, & Mancini, 1989). Inter- and intra-observer agreements were calculated using the equation: (agreements / (agreements + disagreements) × 100) (van der Mars, 1989). The inter-observer agreement was 96.3% and intra-observer agreement was 98.5%, with both conforming to the agreement score of 85% or above recommended by Rushall (1977) and van Der Mars (1989) to provide suitable reliability.

Data analyses

The duration of each coaching session was analysed using a one-way analysis of variance (ANOVA) with country (England; Germany; Portugal; Spain) as the between group factor. The coaching sessions varied in total duration, so the subsequent data were normalised by calculating the percentage of session duration players spent in the two categories of active decision making and non-active decision making, as well as in the

sub-categories. The percentage of time spent in the two main activities and in transition was calculated by dividing the duration of the activity by the total duration of the coaching session and then multiplying this number by 100. The same method was used for the sub-activities of the two main activities.

The data for the two main activities and the transitions violated the statistical assumption of independence, which hold that one data point should not influence another (Field, 2018; cf. Ford et al., 2010). Therefore, to alleviate this problem, after first examining the group mean values for each of the two main activities, we ran a one-way between-group ANOVA on the data for the percentage of session duration spent in active decision-making activity. Additional descriptive statistics (mean ± standard deviation) were calculated for percentage of active decision-making activity time spent in each of its five sub-activities and the percentage of non-active decision-making activity time spent in each of its three sub-activities. For both ANOVAs, the Bonferroni correction method was used to adjust the alpha level required for significance for post-hoc pairwise comparisons. Partial eta squared values (η_p^2) and Cohen's *d* effect size measures were calculated as appropriate. The alpha level for significance was set at $P < 0.05$.

Results

The average duration of the football practice sessions was 88 ± 6 mins. There was no significant difference for average session duration across countries, $F(3, 79) = 2.50$, $P > .05$, $\eta_p^2 = .09$. Figure 1 shows the percentage of session duration spent in active decision making and non-active decision-making activities, as well as transitions by the four countries. Overall, the percentage of time spent in active decision-making activities was 62 ± 9%, whereas non-active decision-making activities was 20 ± 8%, with the remaining percentage of time spent in transition (17 ± 3%).

There was a significant difference between groups for the percentage of time spent in active decision-making activities, $F(3, 79) = 10.49$, $P < .001$, $\eta_p^2 = .29$. Post hoc tests showed that Portuguese (68 ± 9%) and Spanish (67 ± 10%) youth teams spent a significantly greater percentage of session time in active decision-making activities compared to both the English (56 ± 8%) and German (57 ± 10%) teams (all *P*'s < 0.01). In contrast, of course, the English (26 ± 8%) and German (26 ± 9%) youth teams spent a higher percentage of session duration in non-active decision-making activities when compared with the Portuguese (14 ± 8%) and Spanish (15 ± 9%) teams.

Insert Figure 1 about here

Active decision-making activity

The percentages of active decision-making activity time spent in each of its five sub-activities as a function of country are displayed in Table 2. The percentages of session time spent in small-sided and conditioned games for the Portuguese and the Spanish elite youth teams were between 5 to 13% greater when compared to the English and the German teams (see Table 2). Comparable percentages of session time were spent in skills (active) activity (range = 7 to 11%), uni-directional games (range = 5 to 8%), and possession games (range = 8 to 13%) for teams across all the four countries. Lastly, the percentage of time spent in phase of play activity ranged from only 1 to 5% of the overall session time for teams across the four countries.

Non-active decision-making activity

The percentages of non-active decision-making activity time spent in each of its three sub-activities as a function of country are displayed in Table 2. The percentage of session time spent in fitness activity for the German teams ranged between 10 to 14%

higher when compared to the English, Portuguese, and Spanish teams (see Table 2). The percentage of session time spent in technical practice for the English teams ranged between 11 to 16% greater compared to the German, Portuguese, and Spanish teams. Lastly, similar low percentages of session time were spent in skills (non-active) activity (range = 2 to 5%) for teams across the four countries.

Insert Table 2 about here

Discussion

We examined the microstructure of coach-led practice activities across 83 training sessions from under-12 to under-16 age groups within professional football youth academies from England, Germany, Portugal, and Spain. This has been the first attempt in the literature to assess coach-led practice structure in youth football by comparing between countries and contexts across Europe. The percentage of time spent in active decision-making activities (*M* = 62%) was greater compared to non-active decision-making activities, supporting recent findings of more active compared with non-active decision-making activities in youth football practice (Ford & Whelan, 2016; O'Connor et al., 2018). These data contradict earlier findings where non-active decision-making activities were greater than active (Ford et al., 2010; Partington & Cushion, 2013).

There were between-country differences in the relative amounts of active decision-making activity. Youth players from Portugal and Spain spent 10 to 12% more session time in active decision-making activities when compared to both the English and German counterparts. The percentage of practice session time spent in active decision-making activities for the English players in this study is consistent with the

amount engaged by adolescent English football academy players reported by Ford and Whelan (2016) (56% for both studies). The main difference between countries for sub-activities within active decision making was for the percentage of practice session spent in small-sided and conditioned games, with the Portuguese and Spanish youth players engaging in between 5 to 13% more time in this sub-activity than English and German players. A critical element when designing practice environments and activities is that any performance improvement is retained over time and transfers to the competitive setting (Ford & Williams, 2013; Schmidt & Lee, 2011). Although the different football-practice activities used in the analysis of this study likely lead to some level of skill acquisition, active decision-making activities present players with more opportunities to develop perceptual, cognitive and motor skills under transfer-appropriate conditions when compared with non-active decision-making activities (Ford & Williams, 2013). According to the representative learning design (Pinder et al., 2011) framework, practice activities must be carefully structured to maintain the relationships between key sources of information and action for players during practice. Active decision-making activities recreate these situations from competition in which players have a match-like decision with at least two or more options to select and execute (Ford, 2016). These benefits of active decision-making activity were recently shown by Miller and colleagues (2017). They demonstrated that exposing young players to greater levels of active decision-making activity (game-based activities) in practice increased the development of participants' decision-making skills and their involvement during sessions. Similar mechanisms may explain the perceived success of 'street football', involving large amounts of match-like activities, in the developmental histories of professional players in the past (Uehara et al., 2018).

Findings in this study also show that youth football players from England and Germany engaged in higher amounts of non-active decision-making activities during coaching sessions when compared with Portuguese and Spanish youth teams, which is likely to attenuate skill acquisition transfer to match play. Particularly, English players were found to spend a higher percentage (between 11 to 16%) of session time in isolated technical skills' training in comparison with players from the other three countries. At the same time, German players engaged in between 10 to 14% more practice time in fitness activities when compared to the other countries examined. Although the use of drill-based activities containing no or limited match-like decision making for the players may be well intended by coaches (e.g., practice repetition, reduce the demands of game), their overuse has generally been shown to be less effective for learning and promoting positive transfer of game intelligence skills from practice to competition (e.g., Miller et al., 2017) and may even attenuate motor learning by potentially producing inappropriate and inefficient movement solutions (Davids et al., 2008). During these drill-type activities, it is common for coaches to provide pre-instructions to players as to the decision(s) they should execute potentially limiting the acquisition of game intelligence skill and its appropriate transfer to match play.

The key for coaches seeking to develop game intelligence is to schedule more active decision-making activity. To do so, a coach can manipulate key constraints within games-based activity or adapt drill-like practices (i.e., constraints-led approach, Davids et al., 2008) so they contain the same underlying structures presented in match play and to have their players execute match-like decisions, skills and tactics. Such activity can be designed to appropriately challenge the learners existing skill levels (i.e., challenge point, Guadagnoli & Lee, 2004) and will facilitate skill transfer to competition (Miller et al., 2017). Finally, the overall time spent in transitions (i.e., movement from

the end of one activity to the start of another activity) was close to 1/5 of total session duration across all the countries analysed. Less time spent on and quicker transitions by coaches in the future would increase young players' engagement in learning activities.

This is the first study to contain knowledge on differences in coach-led practice within professional football youth academies across European countries. More research would be welcomed to advance our knowledge of both similarities and differences in practice activities used by coaches within youth football-specific contexts across multiple countries and regions around the world. A limitation of this study is that we had no measure of the coaches' intentions when scheduling and leading the various activities. For example, some coaches may have identified their players had a specific issue with a technical motor action/s involving the ball and, therefore, they scheduled non-active decision-making activity (technical practice) in order to improve this aspect of performance. In this case, scheduling a small-sided game may not lead to the required improvement in that specific technical aspect of performance. On the other hand, small-sided games can be adapted to increase the incidence of a specific technical action and technical drill-like practices can be adapted to contain active decision making, in both cases focusing upon improving a specific technical aspect of performance whilst maintaining the benefits of active decision making (see, Ford et al., 2013; Ford, 2016). In future, researchers should measure the intentions and rationales underlying the scheduling of practice by coaches.

In summary, we have examined the practice activities employed by coaches working with youth football players in professional top-division clubs across England, Germany, Portugal, and Spain. Players from English and German spent more time in non-active decision-making activities compared to players in Portugal and Spain. In particular, comparisons between countries for sub-activities showed that players from

Portugal and Spain spent a larger percentage of session time in small-sided and conditioned games, whereas English players spent more time in unopposed technical-based drills and German players in improving fitness aspects of the game. Our findings offer a comprehensive cross-comparison illustration of the practice activities used by coaches working within various professional football youth academies from multiple European countries.

Practical implications

It is recommended that coaches should lead more representative football-specific decision-making activities (e.g., games with adapted rules) during practice sessions with young football players. Additionally, coaches should attempt to reduce time spend in transitions in the future in order to increase players' engagement in learning activities. Consistent with the focus of research in this area, exposing young players to greater levels of practice activities involving active decision making over time facilitates the transfer of skill acquisition and learning to match play.

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Table 1. Categories and definitions of football-practice activities used in the analysis.

Activity	Definition
Active decision making	
Skills (active)	Isolated technical or tactical skills from game situations in a small group with some opposition in which the players are active decision makers
Uni-directional games	Uni-directional in a small group towards one line (e.g., 2 vs. 1)
Small-sided and conditioned games	Bi-directional with a team vs. team but with variations to player numbers, rules, goals, or areas of play (e.g. teams scoring by dribbling across end-line)
Possession games	Games with no goals in which the main intention is for one team to maintain possession of the ball from another
Phase of play	Uni-directional match play in a larger group towards one goal
Non-active decision making	
Fitness	Improving fitness aspects of the game with no focus on technical or tactical skill (e.g. warm-up, cool down, conditioning)
Technical	Isolated technical skills unopposed either alone or in a group
Skills (non-active)	Isolated technical or tactical skills from game situations, in a small group with some opposition in which there is no active decision making for the players
Other	
Transition	Movement from the end of one activity to the start of another activity. It is activity that is not football-related (e.g. drink breaks). This includes the coach's explanation of the forthcoming activity and debrief of preceding activity.

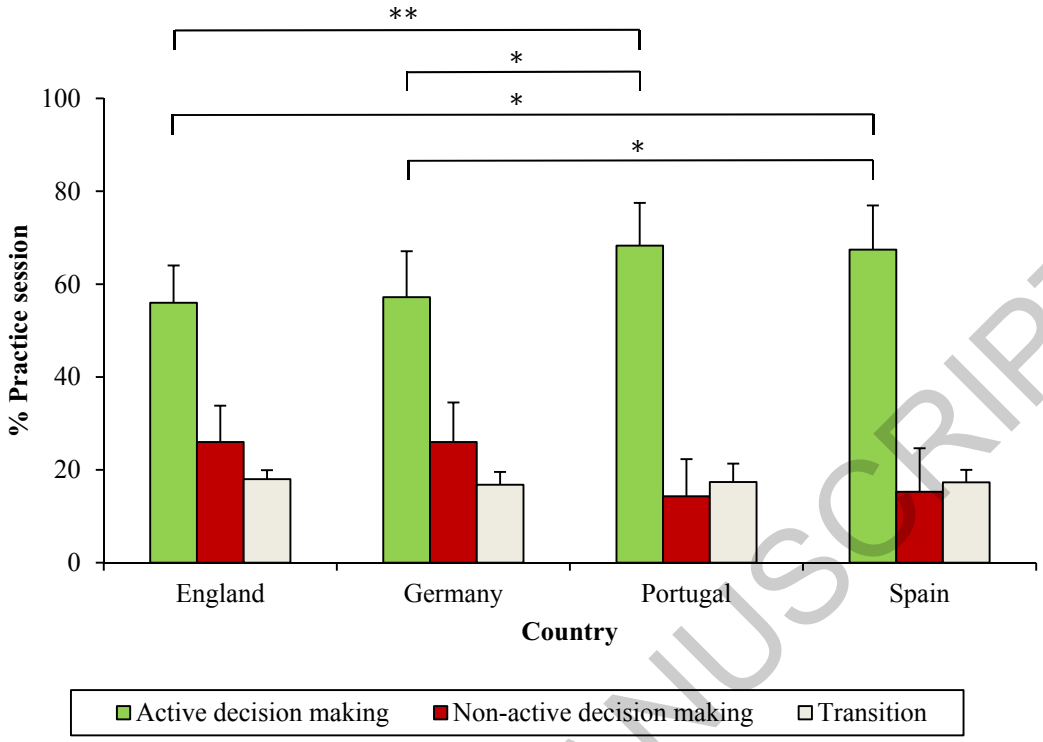

Figure 1. Mean (SD) percentage of session duration spent in active decision making and non-active decision-making activities as a function of country, *$P < .01$ and **$P < .001$.

Table 2. Mean ± SD percentage of active decision making and non-active decision-making activity spent in the sub-activities as a function of country.

	Country			
Activity	**England**	**Germany**	**Portugal**	**Spain**
Active decision making				
Skills (active)	11 ± 9	8 ± 8	10 ± 10	7 ± 8
Uni-directional games	5 ± 7	6 ± 10	6 ± 11	8 ± 9
Small-sided and conditioned games	27 ± 17	32 ± 12	40 ± 18	37 ± 10
Possession games	8 ± 11	10 ± 11	11 ± 18	13 ± 9
Phase of play	5 ± 9	2 ± 4	1 ± 3	3 ± 6
Non-active decision making				
Fitness	4 ± 5	18 ± 6	6 ± 6	8 ± 9
Technical	18 ± 9	7 ± 7	3 ± 5	2 ± 3
Skills (non-active)	5 ± 8	2 ± 4	5 ± 8	5 ± 9
Other				
Transition	18 ± 2	17 ± 3	17 ± 4	17 ± 3