Optimizing the Use of Soccer Drills for Physiological Development

Thomas Little, PhD
Sheffield Wednesday FC, Sheffield, United Kingdom; and Sport Science Department, Derby University, Derby, United Kingdom

SUMMARY

USING SOCCER DRILLS FOR CONDITIONING HAS CONSIDERABLE BENEFITS. HOWEVER, THE PRACTICALITIES OF CONDUCTING SUCH SESSIONS ARE MORE CHALLENGING THAN NON–SOCCER-SPECIFIC CONDITIONING METHODS. THIS ARTICLE EXAMINES FACTORS THAT AFFECT THE PHYSICAL NATURE OF SOCCER DRILLS AND PROVIDES GUIDANCE ON HOW TO OPTIMIZE TRAINING STRUCTURE WHEN USING SOCCER DRILLS FOR PHYSIOLOGICAL DEVELOPMENT.

INTRODUCTION

Physiological development plays a crucial role in defining a soccer player's potential match performance and has been shown to correlate with playing standard (3,36) and performance (3). In particular, training programs aimed at improving aerobic capacities have been shown to enhance aspects of soccer performance, such as the time spent at high exercise intensities and the involvements in play (14).

The physical nature of certain soccer drills used in training suggests that they may be suited to improving a player's endurance capacities. Such soccer drills contain many of the elements of soccer match play, such as passing, dribbling skills, and scoring, but typically involve reduced player numbers and/or modified rules. The use of soccer drills for physiological development has recently gained increasing popularity, with support from scientific literature (13,15,28) and empirical evidence from successful teams (32). It has been demonstrated that several soccer drills have the potential to elicit intensities suitable for developing soccer endurance at elite and recreational levels (20) and in both sexes (21). Furthermore, training programs involving soccer drills have been shown to be equally effective in improving physiological factors important to soccer performance as generic aerobic training (15,28). The voluntary nature of movement during soccer drills meant that there was concern that some players may train at inappropriate exercise intensities for conditioning. However, recent results (18,19,25) suggest that soccer drills can produce sufficiently similar exercise intensities across different players and repetitions (reps) to warrant their application for physical training.

Beyond the obvious advantage of increasing training efficiency with combined technical and physiological training, utilization of soccer drills has several advantages over more generic conditioning methods, such as running without a ball. Motivation of the players is improved when soccer and competition are involved (4). Also, more similar movement types and patterns in soccer drills may also lead to a greater transfer to match specific fitness. Enhanced movement efficiency is particularly a key for unorthodox forms of locomotion, such as side and backward movements, which are frequently performed in soccer drills (26). Furthermore, the metabolic consequences of intermittent exercise, as used in soccer drills and competition, have been shown to be different from continuous exercise at the same average intensity (9).

Despite these significant benefits, generic physical training is still prevalent at all levels of the sport. This may be in part due to the greater difficulty in controlling training load and the increased organization demands when using soccer drills compared with generic physical sessions. Table 1 summarizes the benefits and disadvantages of using soccer drills and generic conditioning methods. The present article aims to review research concerning conditioning with soccer drills

KEY WORDS:
fitness training; conditioning games; soccer; training specificity

Table 1
Advantages and disadvantages associated with physical training using soccer drills and generic running

Soccer drills	Traditional running
A small-sided game with specific constraints (scoring, targets, balls, players, rules, and area).	A controlled running session with players exercising for a specific time and or distance.
Advantages	
Improved motivation	Exact work intensity can be easily controlled
Enhanced training of movement efficiency	Improvements can be monitored objectively
Improvements in tactical awareness	Comparisons can be made between players
Improvements in technical skill	Gain insight into player character/ motivation
Optimizes training time and physical load	
Potential decrease in injuries (10)	
Disadvantages	
Exact work intensity is difficult to control	Less movement associated with match play
Often difficult to organize optimal training structure	Players do not practice technical skills
Increased risk of contact injuries	No game-based tactical elements
Need numbers to make up session	Players do not like running
Certain degree of technical ability required	May increase risk of some injuries due to unaccustomed running (tendonitis, lumbopelvic problems)
Possible ceiling effect for very fit players (13)	

and provides practical guidance on how to optimize such sessions.

TRAINING LOAD DURING SOCCER DRILLS

During physical training, it is paramount that training load, consisting of training intensity and duration, is appropriate for the intended physiological and performance adaptations. Control over training intensity is achieved during generic conditioning by specifying distance and/or duration parameters of the exercise. The voluntary nature of movement in soccer drills means that the control over intensity is potentially less precise. However, evidence suggests that a coach can attempt to control the intensity of soccer drills by selecting specific drills and by manipulating parameters of the soccer drill (19,25). Factors that can influence the intensity of soccer drills include the type of drill, player numbers, player motivation, pitch size, and rule alterations.

The type of soccer drill is often modified by adjusting the number of players within a team. The literature presents a consistent trend between playing intensity and number of players during small-sided games, with lower playing numbers resulting in higher exercise intensities (18,19,25). Video analysis has shown that reducing player numbers results in more continual involvement in play, and relatively more time is spent performing higher intensity activities, such as sprinting (11,12,23). In accordance, 8-a-side to 5-a-side drills (6,18,19,25, 28,30) have often been reported to result in intensities appropriate for lactate threshold development (~85–90% HR_{max}; 11), whereas 4-a-side and 3-a-side games may produce intensities appropriate for VO_2max development (90–95% HR_{max}; 11). Blood lactate and perceived exertion responses indicate that 2v2 drills (1,18,19,27) are suited to anaerobic training. All these training formats are considered critical in developing soccer endurance (3,14). Discussion of optimal endurance training methods for soccer performance is beyond the scope of this article but has been extensively reviewed in previous literature (4,14,31). Table 2 shows the recommended training loads and soccer drills that have been reported to produce suitable intensities for the aforementioned endurance training methods.

Possession games, without goalkeepers, have been shown to increase drill intensity (30). This may be due to fewer breaks in play and the lack of positional movement restrictions. Therefore, possession drills may allow coaches to train higher threshold adaptations with relatively larger team sizes. In addition, rule changes, such as restricting the number of consecutive touches (4,29), man-to-man marking (1,29), and using support players, have been reported to cause an increase in intensity (1).

It may be that larger pitches produce greater intensities (3,22,25), presumably because players cover greater distances and play is more open on the larger pitches. Table 3 shows the pitch sizes used by Rampinini et al. (25) for various small-sided games when examining the effects of pitch size.

Authors (29,30) have reported, and empirically it is often seen, that coach encouragement increases training intensity. Indeed, Rampinini et al. (25)

Table 2
Methodology for the main forms of endurance training for soccer and appropriate soccer drills

Training type	Appropriate training load							Soccer drill examples	
	Intensity			Duration					
	%HR	RPE	Lactate, mmol/L	Total work, min	Rep duration	Reps	Rest	Drill	Reference
Lactate threshold	80–90	Quite hard	3–6	30–60	6–30 min	1–8	<1 min rest	5 × 5	(7,18,19,25,28)
								6 × 6	(18,19,25)
								7 × 7	(6)
								8 × 8	(18,19,30)
Vo_2max	90–95	Stressful	6–12	12–35	3–6 min	4–8	0.5–1 rest ratio	3 × 3	(2,18,20,25)
								4 × 4	(14,18,19,28)
Anaerobic	>85	Maximal	>10	4–16	20 s to 3 min	2–4 sets of 4–8	1–4 rest ratio	2 × 2	(1,19,27)
								3 × 3 possess	(17)

%HR = percent heart rate; RPE = rating of perceived exertion; Reps = repetitions.

Training loads adapted from Bompa (5).

reported that coach encouragement was the dominant variable on playing intensity, when examining the effects of varying pitch size, player numbers, and coach encouragement. Therefore, coaches should aim to maximize motivational techniques when high training intensities are required. Factors that can be used to enhance motivation include a coaching staff providing encouragement, using a competitive playing structure, and providing feedback to the players about intensity (8).

A factor that can influence soccer drill intensity that cannot be controlled by the coach is the standard of the players. Players of low technical ability may not be able to produce high training intensities during soccer drills because play is often disrupted and does not flow across the pitch quickly. Despite this concern, relative intensities have been reported to be similar between amateur and professional players during the same soccer drills (2,20,25,28). Table 4 shows intensities of soccer drills reported in the literature with details of the aforementioned factors that can influence intensity.

Table 3
Pitch sizes considered small, medium, and large for various soccer drills, reported by Rampinini et al. (25) and Owen et al. (22)

Soccer drill	Small	Medium	Large
3-a-side	12 × 20 m	15 × 25 m	18 × 30 m
4-a-side	16 × 24 m	20 × 30 m	24 × 36 m
5-a-side	20 × 28 m	25 × 35 m	30 × 42 m
6-a-side	24 × 32 m	30 × 40 m	36 × 48 m
1-a-side possession	5 × 10 m	10 × 15 m	15 × 20 m
2-a-side possession	10 × 15 m	15 × 20 m	20 × 25 m
3-a-side possession	15 × 20 m	20 × 25 m	25 × 30 m
4-a-side possession	20 × 25 m	25 × 30 m	30 × 35 m
5-a-side possession	25 × 30 m	30 × 35 m	35 × 40 m

ORGANIZATION OF SOCCER DRILL CONDITIONING SESSIONS

The practicalities of organizing a soccer drill session are much more daunting than that of a generic physical session. With generic conditioning, the main practicalities concern producing the appropriate training load. However, soccer drills have an additional number of factors to consider, which are often dictated by training circumstances.

Total player numbers dictate what type of soccer drills can be used because the team sizes used must be a dividable number of the total number of players. For example, 16 players would require 8-a-side, 4-a-side, or 2-a-side teams. Player numbers and team

Table 4
Soccer drill parameters and intensities reported in the literature

Drill	Reference	Pitch size	Duration	Subject standard	Motivation	%HR_{max}	Lactate, mmol/L	RPE (20points)	Vo_2mL·kg^{-1}·min^{-1}
2 versus 2 game	(27)	Not reported	4 × 1 min, 1 min rest	Professional	Coach encourage	~90–95%	11.9	—	—
	(1)	30 × 20 m	3 × 1.30 min, 1.30 min rest	National youth	Unknown	84 ± 5.0	8.1 ± 2.7	16.2 ± 1.1	—
	(18)	30 × 20 yd	4 × 2 min, 2 min rest	Professional	Coach encourage	90.8 ± 1.7	9.6 ± 1.0	16.3 ± 0.9	—
	(19)	30 × 20 yd				88.9 ± 1.2			
	(29)	30 × 20 m	2 × 1.30 min, 90 s rest	National youth	Coach encourage	83.7 ± 1.44	—	15.5 ± 0.59	—
3 versus 3 game	(18)	40 × 30 yd	4 × 3 min	English professional	Coach encourage	90.6 ± 1.3	8.5 ± 0.8	15.7 ± 1.1	—
	(19)	35 × 25 yd	4 × 3.30 min			91.0 ± 1.2			
	(1)	30 × 20 m	3 × 4 min, 1.30 min rest	National youth	Unknown	87.0 ± 3.0	4.9 ± 2.0	14.5 ± 1.7	—
	(2)	36 × 20 m	6 × 3 min, 2 min rest	Amateur	Unknown	95	—	—	—
	(29)	30 × 20 m	2 × 3 min, 90 s rest	National youth	Coach encourage	80.8 ± 1.7	—	15.8 ± 0.19	—
	(25)	25 × 15 m	3 × 4 min, 3 min active recovery	Amateur	Coach encourage	90.5 ± 2.3	6.3 ± 1.5	8.4 ± 0.4 (10 points)	—
4 versus 4 game	(30)	36 × 36 yd	4 × 4 min, 2.30 min rest	Professional	Unknown	88.8	6.2 ± 1.4	—	—
	(24)	Unknown	4 × 4 min	Professional youth	Unknown	88.3 ± 3	—	—	—
	(18)	50 × 30 yd	5 × 3.30 min, 2 min rest	English professional	Coach encourage	90.2 ± 2.1	9.5 ± 1.1	15.3 ± 0.7	—
	(19)	40 × 30 yd	4 × 4 min, 1.30 min rest			90.1 ± 1.5			
	(20)	Not reported	—	Amateur	Unknown	—	—	—	82
	(21)	Not reported	4 × 5 min	Amateur females	Unknown	85.7	4.0 ± 1.2	—	73.6
	(28)	30 × 20 m	3 × 4 min, 3 min active recovery	Amateur	Coach encourage	89.4 ± 1.8	5.5 ± 1.8	7.9 ± 0.5 (10 points)	—

4 versus 4 goal support	(1)	30 × 20 m	3 × 6 min, 1.30 min rest	National youth	Unknown	70 ± 9.0	2.6 ± 1.7	13.3 ± 0.9	—
4 versus 4 side support	(14)	50 × 40 m	2 × 4 min, 3 min active rest	Norwegian professional	Coach encourage	91.3	—	—	—
5 versus 5 game	(28)	Unknown	6 × 4 min, 3 min jogging	Professional youth	Coach encourage	85–90	12.7–13.5	—	—
	(18)	55 × 30 yd	3 × 5 min, 1.30 min rest	English professional	Coach encourage	89.3 ± 2.5	7.9 ± 1.7	14.3 ± 1.5	—
	(20)	45 × 30 yd	4 × 6 min, 1.30 min rest			88.5 ± 1.7			
	(7)	40 × 20 m	Not reported	Professional youth	Unknown	72.0 ± 9.0	—	—	53.0 ± 12.0
	(25)	35 × 25 m	3 × 4 min, 3 min active recovery	Amateur	Coach encourage	88.8 ± 3.1	5.0 ± 1.7	7.6 ± 0.6 (10 points)	—
6 versus 6 game	(18)	60 × 40	3 × 6 min, 1.30 min rest	English professional	Coach encourage	87.5 ± 2.0	—	—	—
	(19)	50 × 30	3 × 8 min, 1.30 min rest			87.5 ± 2.0	5.6 ± 1.9	13.6 ± 1.0	
	(25)	40 × 30 m	3 × 4 min, 3 min active recovery	20 amateur players	Coach encourage	87.0 ± 2.4	5.0 ± 1.6	7.3 ± 0.7 (10 points)	—
7 versus 7 game	(6)	60 × 40 m	Not reported	Professional youth	Unknown	88	1.4–7.3	—	—
8 versus 8 game	(30)	Half pitch	Not reported	English professional	Coach encourage on bottom result	82.0	3.3 ± 1.2	—	—
						89.2	—		
	(18)	70 × 45 yd	3 × 10 min, 1.30 min rest	English professional	Coach encourage	87.6 ± 1.2	5.8 ± 2.1	14.1 ± 1.8	—
	(19)	80 × 45 yd	4 × 8 min, 1.30 min rest			87.9 ± 1.9			
10 versus 10 game	(24)	Not reported	10 min	Professional youth	Unknown	84.3 ± 3.5	—	—	—

(continued)

Table 4
(continued)

Drill	Reference	Pitch size	Duration	Subject standard	Motivation	%HR_{max}	Lactate, mmol/L	RPE (20points)	Vo_2mL·kg^{-1}·min^{-1}
1 versus 1 switch	(22)	5 × 10 m	3 min, 12 min rest	Professional youth	Unknown	86.0	—	—	—
		10 × 15 m				88.0			
		15 × 20 m				89.0			
2 versus 2 switch		10 × 15 m			Unknown	84.2	—	—	—
		15 × 20 m				87.4			
3 versus 3 switch		20 × 25 m				88.1			
		15 × 20 m			Unknown	81.7	—	—	—
		20 × 25 m				81.8			
		25 × 30 m				84.8			
	(17)	40 × 30 yd	5 × 2 min, 2 min rest	English professional	Coach encourage	90.4 ± 1.9	10.4 ± 1.2	16.5 ± 1.0	—
4 versus 4 switch	(22)	20 × 25 m	3 min, 12 min rest	Professional youth	Unknown	72.0	—	—	—
		25 × 30 m				78.5			
5 versus 5 switch		30 × 35 m				77.3			
		25 × 30 m			Unknown	75.7	—	—	—
		30 × 35 m				79.5			
		35 × 40 m				80.2			
4 versus 4 possession	(30)	25 × 25 m	4 × 5 min, 3 min rest	Professional	Coach encourage	—	~6–8	—	—
	(30)	30 × 30 yd	4 × 4 min, 2.30 min rest	Professional	Coach encourage	91	6.4 ± 2.7	—	—
6 versus 6 half switch	(17)	60 × 35 yd	5 × 2 min, 2 min rest	English professional	Coach encourage	89.0 ± 2.1	8.5 ± 1.4	15.8 ± 1.2	—

%HR = percent heart rate; RPE = rating of perceived exertion.

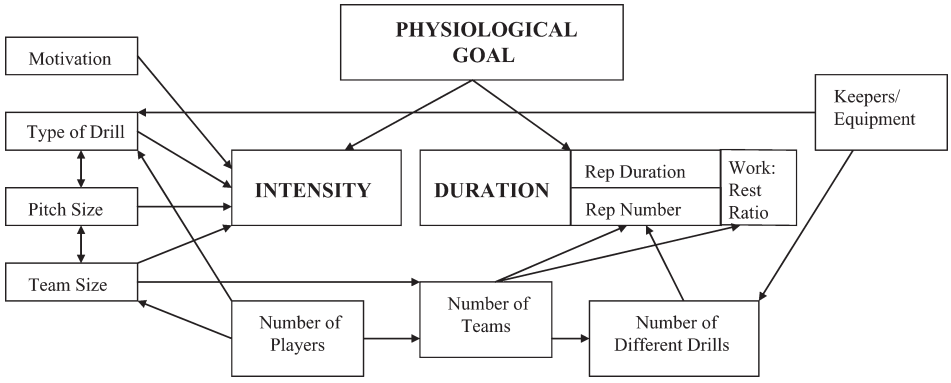

Figure 1. Thought flow in producing the correct training parameters for the desired physiological goal when using soccer drills. Rep = Repetition.

size also affect how many teams are formed. If more than 2 teams are formed, multiple drills have to be set up where teams play simultaneously on different pitches. In addition, the number of goalkeepers and goalposts influences what type of drills can be used. Possession drills without goalkeepers can be used in scenarios where there are insufficient goalkeepers/goalposts for the number of pitches needed. Once the drills that suit the training circumstances have been identified, the coach must select those that have the potential to produce the desired work intensities. The coach must then select appropriate drill parameters, such as pitch size and rules, to produce the desired intensity.

The number of teams and different drills can affect how many reps are performed, if a competitive structure is to be used. A competitive structure involves all teams playing each other an equal number of times. Such a structure can aid motivation levels by increasing competition and placing increased significance on the results. For example, if there are 4 teams, the number of reps would be multiples of 3. However, if different types of drills are used, a competitive structure would require that all teams play each other an equal amount of times and that each team plays the same amount of the different soccer drills. For example, if there were 4 teams with 2 playing 3-a-side and the other 2 teams playing a possession game, multiples of 6 reps should be administered so that each team plays all the opposition teams on both drills. The effect of a competitive structure on repetition numbers often requires that repetition durations are manipulated from what are typically used to produce the appropriate training load. When conditioning, training load must always remain the priority, and therefore, a competitive structure should not be used if it interferes too much with the appropriate repetition duration.

Soccer drills allow simultaneous physical and technical development. Therefore, when possible, the soccer drills used should contain the tactics/technical elements desired by the coach. Normal small-sided games are generally desirable because they closely replicate the demand of match play. Possession drills are often used if the coach wants to emphasize pressurizing opponents or maintaining possession of the ball. Figure 1 illustrates the decision process a coach must use to produce the correct training parameters when using soccer drills for conditioning.

CONCLUSIONS

Recent evidence has supported the potential of using soccer drills to train physical capacities of soccer players and thus provide simultaneous skill and fitness training. Using soccer drills for conditioning has key advantages when compared with generic physical training, such as enhanced motivation and greater transfer to match specific fitness. However, their utilization can present a challenge in producing optimal work intensities and in determining appropriate training structures. Information within this article should aid coaches in choosing and organizing soccer drills and training structures for physiological development.

Thomas Little
is a conditioning coach for Sheffield Wednesday FC and lectures at Derby University.

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