



Training principles in football

Dave Barron shows how the principles of FITT and SPORT can be applied to football training.

With the influx of sport science into professional football, the way in which players are prepared for games has changed significantly over the last 10–15 years. This has been aided by match analysis software and an increasing amount of scientific research that has revealed precise information about the work players perform.

When preparing a periodised conditioning plan the season can be divided into three main periods, each of which has its own conditioning goals:

1 Pre-season: base aerobic and position-specific fitness development.

2 Competition: maintenance of aerobic fitness, development of speed/agility and promotion of recovery from games.

3 Transition: promotion of recovery, maintenance of aerobic fitness and development of strength.

By manipulating the training principles **SPORT** (**S**pecificity, **O**verload and **R**eversibility) and **FITT** (**F**requency, **I**ntensity, **T**ype and **T**ime) the sport scientist can manage the development of the player throughout the season. This article highlights how each of the training principles can be applied in this setting.

Specificity

Training must be relevant to the activities performed in the sport. On average, professional footballers cover approximately 9–12 km per game at an average heart rate of 85% maximum heart rate (Mohr 2005). However, the activities making up these total distances differ from one player to another. For example, defenders perform more backwards movements than forwards, wingers tend to dribble the ball more than any other position, and midfielders cover the greatest distances and also tend to sprint on more occasions (Bloomfield 2007).

These different movements are called 'discrete movements' and also include turning, jumping, sideways movements, accelerating and decelerating. Research demonstrates that players might perform a change in discrete movement every 5–6 seconds (Reilly 2003), and this causes extra energy to be expended. So, when you realise that footballers do not spend much time running in straight lines at one speed, it becomes obvious that they should not rely on this method of training.

Small sided games are a popular method of training that incorporate all these

activities and which are highly specific. These games are played on a smaller pitch and further adjustments to the pitch size, number of players and rules can be used to change the work intensity. By doing so the training effect can be changed slightly depending on the objective of the session (Table 1).

In addition to this, position-specific fitness development drills are often employed. These drills can be used to condition the player in the movements he or she performs most often, therefore developing the energy systems they rely on for successful performance. For example, a midfielder will spend a lot of time breaking forwards to support attacks as well as tracking opposing players deep into their own half. The drill in Figure 1 has been developed to replicate this and develop the player's ability to perform repeated sprints. This drill would predominantly use the lactic acid energy system and would improve lactate threshold.

In order to increase the intensity and overload on the player, a ball could be dribbled or multiple runs could be performed before rest was allowed. This

Table 1 Structure of small sided games depending on training goal

Training type	Intensity (% MHR)	Duration			Football based	Running based
		Time	Reps	Rest		
VO ₂ max	90–95%	3–6 mins	4–8	0.5–1 times work	3–5 aside, possession drills	Interval running
Lactate threshold	80–90%	6–30 mins	1–8	<60 secs	5–8 aside	Continuous running, Fartlek

Adapted from Little (2008)

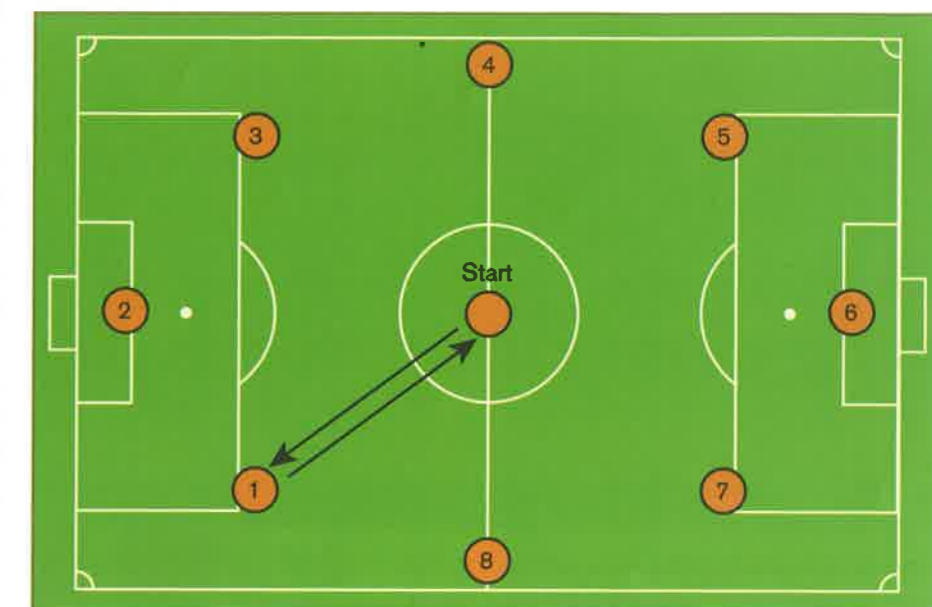
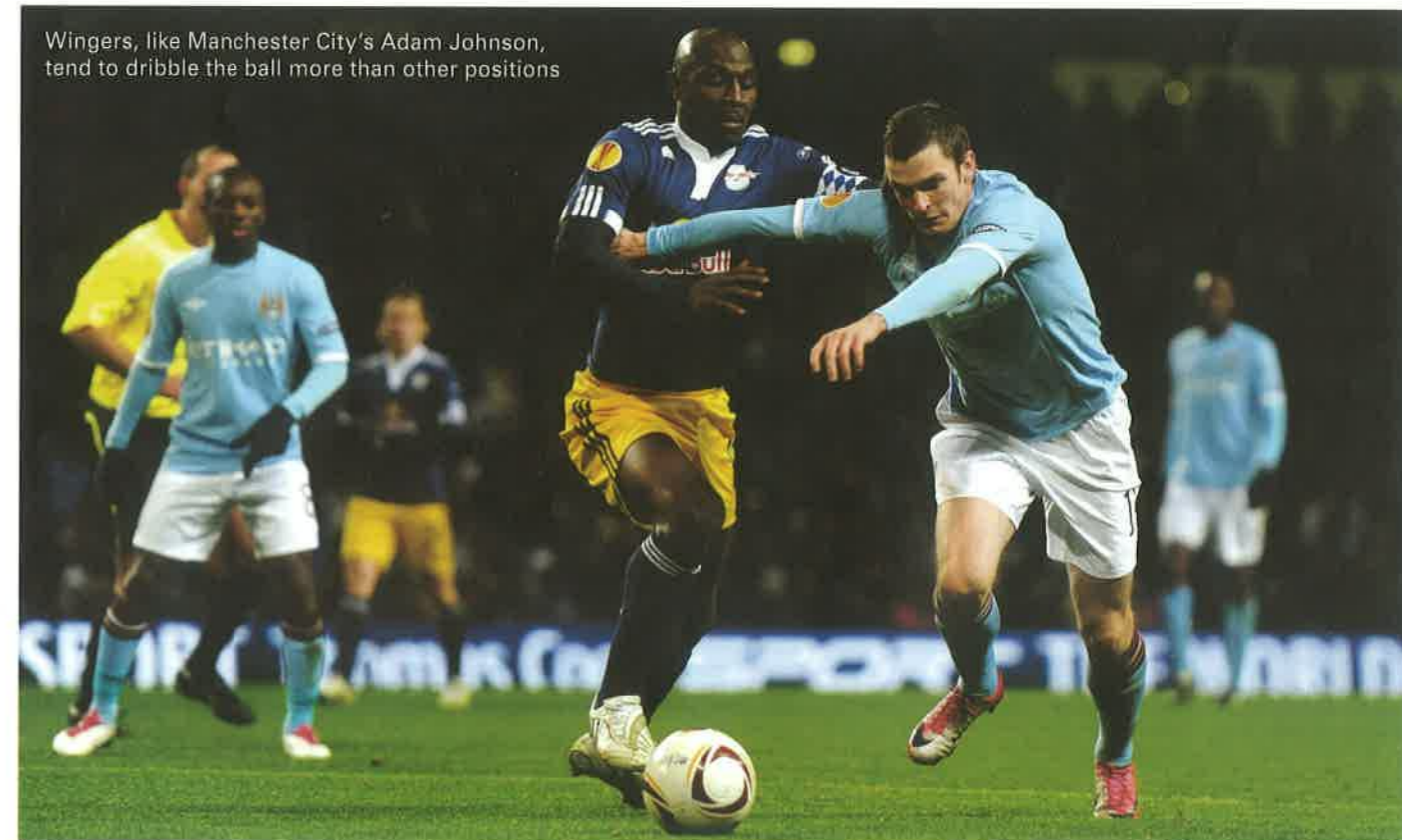


Figure 1 Player starts on the centre spot and must sprint around cone 1, returning to the centre spot within an allocated time. Players perform active rest within the centre circle before completing the remaining seven runs in the same manner. Work and rest periods are the same duration



Wingers, like Manchester City's Adam Johnson, tend to dribble the ball more than other positions

type of drill could be used in the latter stages of pre-season and during the season to develop or maintain the midfielder's match fitness.

Overload

A greater than normal stress or load on the body is required for training adaptation to take place. By exposing the body to a training stimulus that is greater than normal the body will initially become fatigued because of dehydration, depleted glycogen stores and damage to muscular tissue. Depending on the individual's training history, the process of recovery and regeneration can take several days.

By exposing the body to regular training sessions, adaptation occurs and eventually the body will supercompensate (Figure 2). Supercompensation is where the body reaches a level of fitness greater than before the new demands were placed on the body. In this way the player will become fitter, faster or stronger depending on the training stimulus.

Increasing any of the physical capacities cannot be achieved overnight and requires

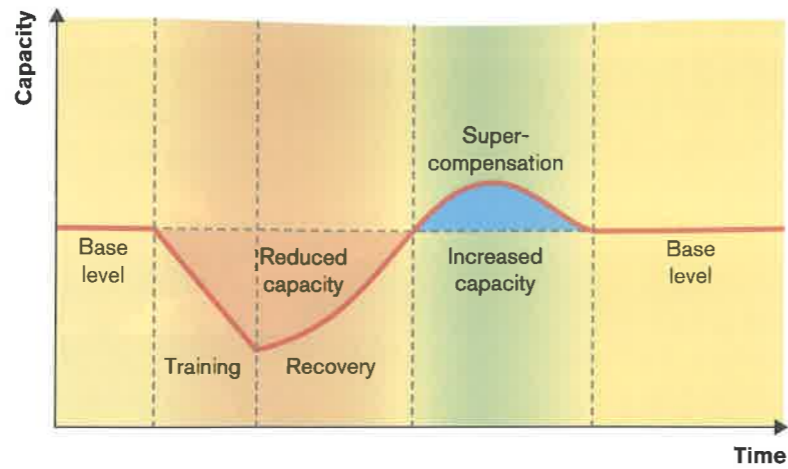


Figure 2 Supercompensation: the adaptation of the body to a training stimulus

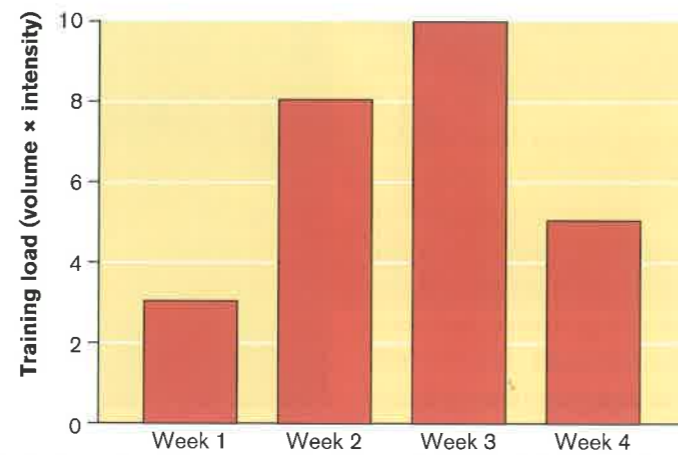


Figure 3 Illustration of a step loaded macrocycle (4-week training period)

Midfielders, like Lee Cattermole, cover the greatest distances



Forwards need speed in order to collect passes

frequent training over a period of time. The scheduling of training sessions requires careful planning in order to guarantee adequate recovery in which the body can adapt. If inadequate rest is allowed a state of 'overtraining' will occur where the body becomes chronically fatigued. In this state the body will have a reduced capacity to perform and is more prone to injury.

A popular way to achieve adaptation and prevent overtraining is through step loading (Figure 3). This is where the training load (volume x intensity) is progressively increased through weeks 1, 2 and 3. In week 4 the intensity is reduced in order to allow recovery and adaptation. However, the training load for week 4 is still greater than week 1 to ensure that reversibility does not occur.

After completing this cycle, weeks 5-8 would repeat in the same pattern, although the training loads of these weeks would be greater than 1-4. This would encourage continual adaptation.

During the pre-season period it is relatively straightforward to employ a structured programme as above. Frequency can be manipulated and players may complete

2 or 3 sessions on some days. Intensity can be manipulated by increasing the distance and time of aerobic building sessions or simply by reducing rest periods between repetitions. In early pre-season it is not uncommon for players to cross-train, where they might undertake swimming sessions, spin-cycle sessions or boxing sessions. However, later in pre-season these are replaced by sport-specific sessions and practice matches in particular.

Reversibility

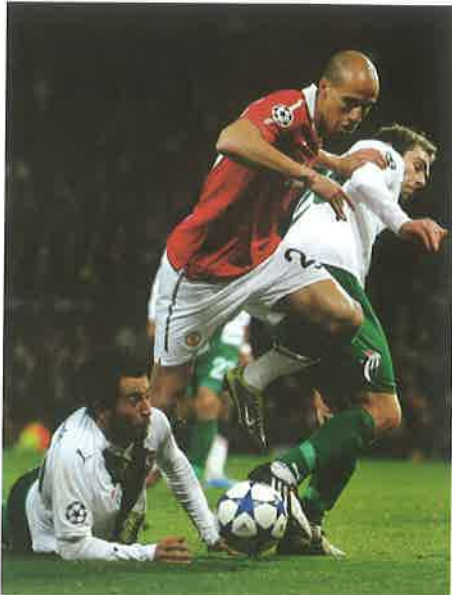
If frequency, intensity or duration is reduced over a period of time the body's

adaptation will gradually weaken and eventually return to pre-training levels. This is most noticeable after the cessation in strength training, where reductions in strength are noticeable after only 7 days. Aerobic adaptations however are more stable and are undone over a period of weeks rather than days.

The implications of reversibility are two-fold for the footballer. What was traditionally regarded as the 'close season' saw players perform little training and consequently much of the adaptations of the previous season were lost. This in part explains the high number of injuries during



Charlton Athletic players during a warm-up



Players who are regular substitutes need a different training regime to the first 11

the following pre-season periods. However, today the gap between seasons is regarded as a transition and players are required to complete maintenance training and report fit for pre-season. Often the work players perform will be individualised, based on the number of games they have played

and their performance in end-of-season fitness testing.

Those players who are regular substitutes can experience a drop in fitness if they are not monitored carefully. Often substitutes will follow the same regime as the first 11 and have a reduced training load, especially during periods of intense competition like Christmas and Easter. However, the first 11 maintain their fitness due to their minutes on the pitch, whereas the substitutes do not. It is therefore important that these substitutes perform additional training to compensate for their lack of playing time. If this is managed successfully they will be able to return to the starting line up without a decline in match fitness.

Conclusion

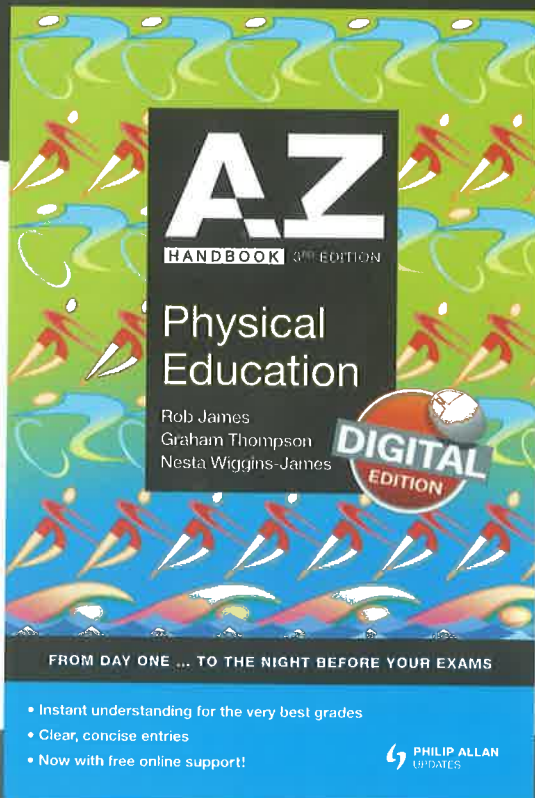
With the increasingly cut-throat nature of football the importance to the manager of having as many players fit and available for selection as possible cannot be underestimated. The training principles are key variables that when manipulated correctly

Further reading

- Bloomfield, J. Polman, R. and O'Donoghue, P. (2007) 'Physical demands of different positions in FA Premier League soccer', *Journal of Sports Science and Medicine*, Vol. 6, No. 1, pp. 63–70.
- Little, T. (2008) 'Intricacies of Conditioning with Football drills', *Insight: the FACA Journal*.
- Mohr, M. (2005) 'Fatigue in soccer: a brief review', *Journal of Sport Sciences*, Vol. 23, No. 6, pp. 593–599.
- Reilly, T. (2003) 'Motion analysis and physiological demands' in A. M. Williams and T. Reilly (eds) *Science and Soccer* (2nd edn), E & F N Spon, pp. 59–72.

will result in optimally prepared players. A periodised conditioning programme is important in outlining the journey of the players towards fitness and is underpinned by the coaching staff, the medical staff and sound nutritional habits.

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