

Movement Training for Football

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This article looks at the application of speed and agility training specifically for football. The term movement training is used, rather than the more traditional speed and agility due to the fact that the key aim of training is the enhancement of on-field performance. While this concept may appear merely semantics, it does represent an important concept, i.e. the specific application of traditional speed and agility techniques to sports movement. On-field football performance requires the integration of speed and agility with football skills, and here movement control is vital and not simply the speed of movement which is the main aim of traditional speed and agility training. For this reason, the term movement training is preferred, reflecting the movement requirements of the game. While this article focuses on football, the principles outlined here can easily be applied to all team and field sports.

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A look at any football game, at any level, clearly demonstrates the importance of quality movement. Movement binds together all of the skills of the game into a coherent flow, and in this way quality movement is fundamental to quality play. Movement is so important in football that often what marks outstanding performers is not solely the level of skills, but the quality of movement that accompanies these skills. When evaluating the quality of movement used by players, it needs to be evaluated not only in terms of speed, but also in terms of efficiency, and effectiveness, with the ultimate test being the ability to effectively carry out the skills of the game.¹² Quality movement facilitates quality football skills, so much so that often, when skills break down, it can be traced to poor movement, in so much that the athlete's movement and the resultant body position etc did not allow for the effective accomplishment of the skill.

Given the close relationship between football skill and movement, for optimal effectiveness movement training must be seen as more than simply speed and agility, and related drills.⁸ What will ultimately decide the effectiveness of any movement training programme is ensuring that movement allows for the effective execution of the required football skill.⁸ In this way, simply getting to the ball quickly, will never be optimal unless the player arrives at the ball in a position to carry out the required skill such as shooting, passing etc. To optimally achieve this, movement drills need progressively to be related as closely as possible to requirements of football, and success needs to be measured not necessarily by improved times in an agility drill, but by improved performance on the field.

Physiological versus biomechanical analysis of movement in football

While the importance of quality movement to football performance is clear, the vast majority of movement analysis carried out to date has been predominantly physiologically based. Much of this has been the evaluation of movement intensities, and whilst different types of movement have been identified such as jogging, sprinting, walking, etc,¹⁶ there is a paucity of data relating to the precise movement patterns employed within these broad classifications. In this way little data exists on the types of movement patterns employed during a football game. For example, with the use of backpedalling, key questions still exist such as, when it is employed, what is the average distance used, what are the subsequent movements employed after the backpedal etc. In actuality, this data is equally, if not more important than the physiologically based data when it comes to developing an optimal movement based programme. Without analysing the type of movement required in football, and evaluating the optimal mechanics required to perform these movements, football movement training can never be optimised.

Start with the end in mind

Any effective sports movement programmes need to focus on the end product they are trying to achieve. With football, movement training needs to produce players who are able to produce effective and efficient movements that place them in optimal position to perform the key football related skills. In short, the aim is to make them better football players, and this must be the aim of any movement training programme. This requires that they are able to move effectively in game situations and in response to the key perceptual and decision making factors that

stimulate movement.²² This ultimately requires that sound and effective movement patterns are stable and automated, enabling players to be focused totally on reading and reacting to game situations in the knowledge that their movement patterns will help them get to a position from where the skills required can be best produced. It also requires that players are able to identify and react effectively to the key perceptual cues, enabling them to pick up anticipatory information and move accordingly.²

In this way, the results of any movement training programme must be judged on the quality of movement produced in games, and not simply on the performance of drills. By starting with the end in mind, this can create a routemap through a movement training programme for any player. Once the ultimate aim is established, then it is possible to work back through a development programme that will bring the player to this level. Also, by focussing on game related movement, a framework for evaluation can be set up, where a player can evaluate the effectiveness of movement patterns in a game, and identify areas of strength and weakness.

The nature of automation in movement

In football, movement binds together football skills, and in game situations focus needs to be on the football skills, with movement patterns happening automatically. Automation of effective movement, that is directly transferable to the game situation, is therefore a key goal in any football movement development programme. This automation requires the player to achieve a level of development where they no longer have to pay conscious attention to producing movement, with quality movement happening automatically. As with most skills this requires a great deal of



practice of the movement patterns involved. One of the challenges of football is its random nature, and whilst automation is achievable, it must be set against the exact movement requirements of the game, where movement patterns vary in terms of a multitude of factors including direction, speed, position of the opposition, position on the field, position of the ball etc. In this way an almost infinite number of movement combinations are possible in a game, and clearly repetition of all the possible combinations of the above factors would be an impossible challenge, even for the best coaches with no time limits.

A key to developing football movement skills lies in the way in which skills are learned. Schmidt's Schema theory, of generalized motor programmes,¹⁷ provides a model which explains the development of skills in situations such as football with its multitude of movement situations, and provides vital information to guide the development of skill development programmes. The Schema theory states that rather than producing a single motor programme for each movement required, what is produced is a general programme, which can be varied according to the precise requirements of each given situation.¹⁷ In this way, the basic skill of sideshuffling would be developed as a general programme which could then be altered in terms

of speed, distance, and direction etc, with the player applying the general programme to the task at hand. This is analogous to learning to drive; once the basic skills have been mastered we can drive on any road, and not only ones that we have practiced on.

Players therefore need to develop generalised motor programmes (schema's) for the key movement patterns used in football. These can then be applied to increasingly football specific tasks.¹⁸ A key feature of the Schema theory is that athletes need to learn rules about movement, rules which can then be applied to various situations.¹⁹ In developing movement rules, four key features of information can be identified:¹⁹

1. Information about the initial conditions (e.g. example, body position, foot position etc)
2. The movement pattern parameters (e.g. speed, direction etc)
3. Augmented feedback about the outcome of the movement
4. Sensory consequences of the outcome (how it felt, looked etc)

If all four of these elements are in place, then skill learning and schema development will be optimised. If any of the four are missing then schema development will be retarded.¹⁹ In many instances, although the information may be present the player may not have the skill to be able to utilize it and here the coach will need to draw the player's attention to this information.¹⁸ This is one of the great skills of an effective movement coach, and requires a deep understanding of movement in the football context, as well as of the basic mechanics underlying effective movement and of the pedagogical theories underpinning skill acquisition. In this way the coaching of drills and movements is so much more than the drills themselves, and coaches need to ensure the presence of the above information if the session is to produce optimal learning, and hence optimal movement development.¹⁰

Movement outcome feedback – the art of guided discovery

A critical feature of optimising schema learning is the need for movement outcome information (Augmented feedback). An interesting feature of schema learning is that there are positive learning benefits from both correct and incorrect movements. What is critical for the incorrect movements is that they are identified when they occur, and the reason for them sought. This can take the form of guided discovery, and intelligent coaching, encouraging the athlete to evaluate their movement patterns is one of the best ways of developing effective schema based movement patterns. This also empowers athletes to evaluate



“Players just starting a programme will need relatively simple drills”

and correct their movements, which provides for a powerful learning environment.¹⁸

This guided discovery can be instigated from the start of any movement programme, whereby, rather than provide a list of coaching cues before movement, players can be encouraged to try a drill or movement, and then, with the aid of effective coaching interactions, come up with the answers to any movement issues identified. Here effective questioning techniques are a key coaching tool and questions such as why do you think that worked, what happened there, how did it feel etc are great tools in enhancing guided discovery, as they draw the athletes attention to the key features of the movement pattern. In this way players can increasingly evaluate their own movement and gain the ability to draw out the information on the four key features highlighted above.¹⁸ Once players can evaluate why things are happening as they are, they can greatly enhance the learning gained from all movement experiences. This skill also transfers well into game situations where players are able to evaluate performance and make any necessary adjustments. Clearly, simply performing a drill, however well designed, without recourse to utilising the optimal mechanics and the application of augmented feedback where needed, can never be an optimal skill development experience.¹⁰

In providing optimal augmented feedback it is important that the complexity of the guided discovery is appropriate to the athlete's development level, and grows with the athlete, allowing the athlete to access important movement based information.⁵ This requires an accuracy of coaching, where movement based questions which promote guided discovery are used, whenever movement patterns need to be addressed, or a learning experience presents itself. These need to be targeted at the most relevant sources of task information.²⁰ In many cases, football skill breakdowns can be traced to movement mistakes, and these can provide for effective learning situations when combined with quality coaching.

The application of drills also needs to be appropriate to the player's performance level. Players just starting a programme will need relatively simple drills, where the focus is on identifying their optimal mechanics in a number of basic movement patterns such as backpedalling, sideshuffling etc. However once these patterns are established the ultimate aim is their transfer to the game, and this requires the use of drills that progressively develop the key movement patterns and combinations of the game and ultimately utilise open conditions that as closely replicate game situations as possible.¹ In this way there should be a move from general patterns through to highly specific drills through the whole development programme.¹

Variability of practice

Given that the aim of movement training is to produce a series of general movement rules, that can be applied to different situations, then variability in training is crucial.⁷ Variability in practice requires an athlete to constantly evaluate the four key movement features, and strengthens the developments of the schema rules.¹⁸ This is especially the case when supported by intelligent augmented feedback which encourages the evaluation of the key features. Some degree of variability needs to be built into practice at all levels, but is crucial in the development of the automacy required at the highest levels of performance.⁹

Perceptual skills are a key part of football movement

High level football performance requires that players are able to move and produce football skills in relation to a multitude of football specific perceptual cues. This ability to anticipate and respond to key perceptual cues is typical of higher level athletes,² and evidence suggests that this skill is very sport specific.¹ Therefore, movement training ultimately needs to be directly related to the key movement patterns and perceptual cues present in football. The key stimuli to football movement are the movement of factors such as teammates, the opposition and the ball. As movement in football is relatively continuous, the regulation of movement is far more dependent upon environmental stimuli than in discrete tasks.¹⁹ In this way, it is vital that the player is subjected to drills and exercises that develop these perceptual skills as well as simply movement patterns. Fitts et al⁴ suggest that there are three main areas of perceptual information that an athlete needs to be able to identify, and that these form a continuum from simple to complex. In their model, a player would need to identify three factors about environmental stimuli, namely:

- its position
- its velocity
- its acceleration

Fitts et al⁴ suggest that at the earliest stages of development players may only be able to pick up the simplest of this information, which is position. With increased practice, the player will be able to identify and utilise firstly velocity information and later acceleration information.¹⁵ What is clear is that perceptual skills need practice, and given that they are sport specific¹ this requires that movement training is as football specific as possible once basic movement patterns and movement combinations have been stabilised. Additionally, perceptual information needs to conform to a hierarchical system, with increasing levels of complexity used through a development

process.¹⁹ This further emphasises that advanced athletes will gain more from random football specific drills, than closed general drills.

Practice should ultimately replicate the game requirements

If the aim of the movement programme is to improve football performance, then it is crucial that any improvement in movement transfers directly to the game.¹² Given the need for both movement specificity and the development of perceptual skills, then the need for drills to relate to football is clear. All drills must therefore be evaluated in terms of their direct transfer to the game. A programme that simply consists of closed drills, despite the fact that these can produce effective movement patterns will never be totally successful in that it will not address all of the key requirements for schema development, and will therefore not transfer effectively to the game situation.²²



This replication also needs to work on a wider basis than just movement patterns, and needs to look at all of the key environmental factors that affect movement.²¹ These include identifying and replicating the multitude of initial conditions from which movement will be required and identifying key stimuli that the player needs to react to in a game. In this way, movement cues within drills need to be factors such as opposition movement, ball movement, and not simply a signal such as a whistle etc.

Additionally, a weakness with many closed drills is their predictability. Once movement is started, there is a pre set sequence of movement, from which the athlete does not need to deviate. This is never the case in football, as movement requirements can change instantly, For example a full back sprinting back to cover a winger, although running at high speed may be required to stop and change direction instantly if the winger decides to check. This type of movement change can never be totally developed by the use of closed drills. What is important here is that the typical movement changes seen in football are identified, such as moving from a sideshuffle into a sprint, and are developed and tested in game like drills, and in relation to the key perceptual skills required in a game.¹³

The target classifications

It is clear that for any football based movement programme to be effectively set up, the movement requirements of the game must be identified, and developed. Additionally, when the movement patterns used in football are identified, their aim within a game must also be clearly delineated, so that the transfer to the game is maximised. This is important as often movement patterns are developed in a way that does not transfer to the game, as their target function is not addressed.¹³ By addressing both the movement patterns and their target function, a series of development drills can be set up which hone the precise movement patterns required, and address these according to their specific role in football. To aid in this it is useful to be able to classify movements in terms of their target function. Jeffreys⁹ proposed that three classifications of target movement functions can be identified. These are:

1. *Initiation movements* – Movements that are used to start or change motion.
2. *Transition movements* – Movements that are used as preparation for subsequent actions, the aim being to maintain a position from where subsequent action can be effectively and efficiently employed.
3. *Actualization movements* – These represent the key movements that ultimately decide the success of the actions. These normally involve a football related skill, or moving to a given position as quickly as possible.

TYPE	AIM	MOVEMENT PATTERN
INITIATION	Start to front Start to the side Start to the rear Change direction	Acceleration pattern Crosstep / hip turn Dropstep Cut step / plant step
TRANSITION	Static wait Jockeying Moving to the side Moving to the rear Moving to the front/curved Tracking the attacker diagonally Deceleration Controlled movement to front	Athletic position Moving athletic position (the bounce, with hip turns) Sideshuffle Backpedal Efficient running action Cross-step run, body facing target Chopsteps to athletic position Athletic position chopsteps/ adjustment steps
ACTUALIZATION	Acceleration Move to top speed	Acceleration movement patterns Kick from a rolling start

Figure 1. Movement patterns in football

While these classifications are useful in delineating the aim of any motion pattern, it must be remembered that the player will constantly be moving between these patterns and that the pattern itself may only last a split second. Even actualization movements may not last long, for example a striker making a rapid acceleration towards the near post, an actualization movement, may, sometimes almost immediately, have to cut and change direction, making a second actualization movement to the far post if they feel the defender has covered this initial motion, this second actualization movement may then have to be further stopped for fear of moving offside. In this way the classifications are simply a tool to assist movement development, and not necessarily an end in themselves.

Key Football movement patterns

Using this classification, football movement can be broken down into key tasks that need to be achieved, such as starting to the side, starting to the rear etc.¹³ Once these tasks are identified, then the optimal movement patterns to achieve these tasks can be set out. *Figure 1* outlines the key movement tasks to be achieved within each target function classification, and the key techniques that need to be developed to achieve these tasks. These then form the basis of the movement pattern development process, representing the key skills to be developed at the foundation stage - a virtual movement syllabus. It is important to note that *Figure 1* is a simple classification, and within these movements are broad ranges. For example initiation movements need to be performed from both standing and moving positions; additionally these moving positions are likely to be in a range of directions and using a range of movement patterns such as backpedalling, sideshuffling etc. Additionally, running patterns need to include curved patterns and not just straight line running, and these variations need to be considered when constructing the movement training programme.

Developing the target mechanics

Figure 1 identifies a range of key basic techniques, which should form the cornerstone of any movement training programme. What is crucial here is that when these movements are performed, they are performed with a technique that optimises performance. This optimal technique can be termed the target mechanics, and needs to be based on sound biomechanical principles, allowing the optimisation of movement efficiency, effectiveness and force production.⁸

For each movement pattern, the key movement mechanics can be set out.⁹ These mechanics provide a coaching template for both the selection and application of drills. Whenever a coach selects and applies a drill, they need

“Players need to be able to move effectively in game situations and in response to the key perceptual and decision making factors that stimulate movement.”

- Develop the key discrete movements of soccer.
- Focus on movement quality not movement speed.
- Focus initially on single task skills.
- Use quality instructions utilising all three communication preferences.
- Perform skills in uncompetitive situations until the movement pattern is developed.
- Break down skills into smaller parts where appropriate.
- Use frequent feedback but without undue precision, encourage Guided Discovery.
- Target only one area during feedback.
- Use distributed practice to minimize fatigue.
- Blocked practice can be used initially but then introduce random practice methods.

Figure 2. Guidelines for coaching at the Foundation Phase

“Effective and efficient movement is fundamental to football performance, and can be the difference between average players and top class players.”

to ask themselves two key questions, namely does it promote the target functions that relate to football and is the player using the target mechanics. Optimal mechanics will focus on three main areas: posture, arm action and leg action.⁶

Posture This includes body alignment, weight distribution, centre of gravity position, line of gravity in relation to the base of support and head position.

Leg Action This includes foot placement in relation to the body and leg, weight distribution on the foot, leg alignment, force production potential, direction of forces, base of support etc.

Arm Action This includes amplitude of action, direction of action, force production potential etc.

In this way, each and every movement pattern will have its own target mechanics. These provide the basic mechanical rules around which optimal technique is based. While there will be a certain degree of individualisation within techniques used, all must comply with basic mechanical principles. Just as there are subtle technique differences amongst the world’s top sprinters, all the techniques used comply with the general rules that govern motion.¹² The key when evaluating technique is to evaluate whether the player is achieving the basic mechanical requirements, and will it transfer directly to the game. A good example is the sideshuffle motion, a key transition movement in football, and used as a player is waiting to react to various stimuli such as a move by an attacker. In this way, the ability to redirect is vital to effective sideshuffling in football, and this redirection may occur at any time. This requires that the centre of gravity is kept stable and low, and the player’s feet are kept low to the ground. However, often when this drill is performed many players will come up and down when performing this motion, with their feet coming high off the ground. While this action may allow them to get from A to B relatively quickly, when in the air they cannot redirect, and so the up and down movement would be totally ineffective in the context of a football game and so should not be taught or allowed in drills. This is a good example of the importance of starting with the end in mind, and not simply focussing on the drill.

Towards a system of development

When looking at football, a range of different football skills can be identified, such as shooting, passing, heading, tackling etc. In reality, few coaches would ever think of developing all of these skills simply from playing a game. Instead, these are developed progressively over time, starting with the basic mechanics and moving through developmental stages until they can be produced automatically in game like situations. This process takes time, and requires a series of progressive drills and exercises that takes the player through the three stages of motor learning. However the same cannot be said for all movement training. In reality much movement training merely consists of the performance of a number of drills, where numerous movement patterns are combined, but

with little emphasis on the mechanics underlying the movements.¹³

In reality, skills are built upon previously acquired capabilities,¹⁹ and therefore a sound base of stable movement patterns is critical to optimal movement development. In this way, the complex football specific movements we see in a game need to be built on firm movement foundations if they are to be optimally developed. These foundation movements need to become automatic and stable, as in learning new skills there is a high dependency upon stable patterns.¹⁴ It is crucial that movement training is sequentially developed and that a framework of development is established which conforms to skill development principles.¹² Previously Jeffreys¹¹ identified three key phases of movement skill development: the foundation stage, the development stage and the peak stage, and they provide for an appropriate system from which a development programme for football can be established.

The Foundation Phase

The major aim in this stage is to establish the key movement patterns,¹¹ and the fundamental movements identified in *Figure 1* should be the focus of the work in this stage.¹³ Players who develop excellent movement patterns in these movements will find it easier to master the more advanced movement patterns required later.¹⁹ While the drills required for the development of these patterns may appear basic, they really are the key building blocks of any movement programme. As with all skills, quality practice, supported by augmented feedback and guided discovery is required in order to master these movements. Jeffreys¹¹ presents guidelines for the optimal application of coaching in these phases which can be summarized in *Figure 2*. At this stage the need for football specific related drills is relatively limited, but what is important is that the drills used are selected to ensure that optimum transfer to football performance will occur at a later stage.

A key to effective coaching is to provide the feedback that will enable players to generate the required information to achieve an effective schema,¹⁹ namely:

1. Information about the initial conditions
2. The movement pattern parameters

3. Augmented feedback about the outcome of the movement

4. Sensory consequences of the outcome

To achieve this, quality coaching, encouraging guided discovery will be vital. Via appropriate feedback, players can be guided to gain the information needed to develop quality movement schemas.¹⁰ The movements in *Figure 1* also give a useful movement syllabus for football, and coaches can use this to ensure that all of the key movement patterns required are worked on within any given timeframe.

The Development Phase

This stage is a progression from the basic movement patterns of the foundation stage, to the highly specific football movement of the peak stage.¹¹ Players at this stage will have effective technique in all of the foundation movements required in football. What is now vital is that these movements can be pieced together progressively to slowly build up what we know as football movement. This is analogous to basic dance steps being put together into a whole routine. At this stage it is not just the main movements that are important, but the way in which they are smoothly pieced together, again just as a quality dance routine. Many players' movement patterns break down, not in the performance of a single pattern, but in the change between one and another, for example between a sideshuffle and a backpedal. This is a problem for a programme that completely differentiates between linear speed and lateral speed, as these are never differentiated in this way in football, and in this system, crucial movement combinations may never be developed.

It is important that players develop the ability to move effectively between movement patterns, and identifying typical movement sequences is fundamental to this. This requires an effective analysis of how movements are put together in football, and videos of football matches are a great tool, in achieving this. For example when a player backpedals, what are the subsequent movements, and what actions trigger the subsequent movements.

Figure 3 outlines typical movements that follow a backpedal. Armed with this information the coach

ACTION	MOVEMENT PATTERN
Turn and sprint to the rear	Drop step and accelerate
Turn and track an attacker diagonally	Drop step and cross-step run
Move sideways	Plant and sideshuffle
Immediately perform a football skill e.g. tackle, jump for a header	Plant and use the skill
Stop and wait	Plant & assume moving athletic position
Stop and move forwards	Plant and accelerate forwards

Figure 3. Transitions from a backpedal

- Focus on the key transitions and movement patterns of the target skills.
- Initially use closed drills and then gradually move to open drills.
- Increase the speed of drills and introduce competition.
- Increase the variety of drills.
- Gradually reduce the quantity of feedback, whilst increasing its precision.
- Challenge athletes to monitor their performance via questioning in feedback, promote guided discovery.
- Practices should be randomly distributed and include variance.
- Drills should increasingly be performed in the target (football) context.

Figure 4. Guidelines for the Development Phase

can then build drills that reinforce these patterns. Initially these can be closed but increasingly they should be open drills, with the player required to react to the same stimuli that they will need to react to in a game. For example a two player drill may involve player 1 backpedalling while player 2 runs at them with the ball. Player 1 will then need to react to the movements and actions of player 1, and then initiate the appropriate response to whatever actions player 2 takes. In this way the whole sequence will resemble a game situation, with the key stimuli recreated. Appropriate coaching intervention on the result of the movement can make this an ideal learning experience.

Once these movement combinations are developed, drills should become increasingly football specific, requiring movement to be increasingly triggered by the stimuli to which a player will need to respond to in a game. Guided Discovery should again be emphasised through appropriate coaching interventions. Guidelines for coaching at the development level were given by Jeffreys¹¹ and are summarized in *Figure 4*.

The Peak Phase

The key aim of this phase is to ensure maximal transfer from the previous two phases to football performance. To facilitate this, random, football specific type drills should predominate. While the game situation is the target context in which the player will need to perform, simply playing the game will not necessarily produce the ideal movement development environment, as the

- Use a variety of complex open drills.
- Drills should be highly football specific and in the target context.
- Drills should be randomly distributed and include variance.
- Feedback should be infrequent but precise.
- Feedback should enable the athlete to answer movement related questions.

Figure 5. Guidelines for the Peak Phase

information required for optimal schema development may not always be easily accessible or identifiable. Instead situations which mimic aspects of the game are better suited, where specific movement patterns and combinations can be targeted, and with appropriate coaching interventions made. These also need to replicate the visual and perceptual requirements of the game.

What is vital is the quality of augmented feedback provided, and the quality of the players own guided discovery. Augmented feedback needs to be precise, and at a level that enhances the performance of an already experienced player. Much of the success of this phase will be based upon the successful completion of the previous stages,¹⁹ as this provides players with sound movement patterns and movement combinations, able to perform these automatically and in a range of football specific conditions. As with all phases, the quality of coaching and practice design is crucial, and guidelines for coaching in the peak stage were given by Jeffreys,¹¹ and are summarized in *Figure 5*.

Conclusions

Effective and efficient movement is fundamental to football performance, and can be the difference between average players and top class players. Movement is a skill, and as such can be trained and developed, and, as with most skills, this requires a long term approach, based upon sound motor control principles. By breaking football movement down into constituent parts, a progressive system of development can be set up, which optimises movement development and its transfer to enhanced football performance.

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