

OPTIMISING SPEED AND AGILITY DEVELOPMENT USING TARGET CLASSIFICATIONS AND MOTOR LEARNING PRINCIPLES – PART TWO

Ian Jeffreys BA(Hons), MSc, CSCS*D, ASCC, NSCA-CPT*D

Part one of this article deconstructed agility movements into a number of basic patterns, each with their own target functions and mechanics. In this article, this theme is developed to address the issues of constructing agility development programmes which conform to the basic principles of motor learning. In this way, the long term development of agility can be optimised

Optimising drill distribution within a session

Part one of this article outlined the need for selecting drills that develop the key target mechanics associated with a given movement. Once selected, the way in which they are arranged can also influence skill development.

Random practice, where different drills are carried out on successive trials is the most effective way of enhancing the long term development of skills.^{5,6,10} This is believed to be due to the fact that during a random practice, athletes must retrieve a motor program and parameterize it before each movement, as they are producing different movements from one practice attempt to another.¹⁰

Random practice is the preferred method of drill distribution within a session, apart from with complete beginners, where blocked practice (where all the reps of a single drill are performed successively) can be effective.⁹ To utilise this advantage, drills should be randomly arranged wherever possible. *Figure 1* outlines how three attempts of four drills (sideshuffle, cutting, backpedal and cross-step) can be arranged in a blocked arrangement and a random arrangement.

Variability in practice, where the drill is varied on successive trials, is another excellent tool for the coach, and can enhance error detection capacity,⁴ which can further contribute to an ideal learning environment. All drills can be varied in terms of

direction, distance, or movement combinations e.g. a sideshuffle drill can be over varied distances, and can be followed by a sprint away in multiple directions. By varying each drill as often as possible, what is developed is a general capability to produce many different versions of a class of actions, a general rule for movement, rather than just the capability of producing one action, in other words a schema.⁷ This is especially effective for developing skills in open situations.⁹

Coaching is key

The amount of quality practice is possibly the most important element of any skill development programme. In developing agility, simply selecting an appropriate drill for an athlete, one which develops the key movement patterns and mechanics, is only one part of the equation. Equally important, if not more, is the quality of the athlete's movement during that drill, and

Ian Jeffreys is currently Director of Athletics and Athletic Performance at Coleg Powys in Brecon, Wales. He is the Strength and Conditioning Coach for the Welsh Schools Rugby Union National team at Under 16 level.

A registered Strength and Conditioning Coach with the British Olympic Association, an NSCA Coach Practitioner, and a Board Member of the United Kingdom Strength and Conditioning Association, Ian was voted the NSCA High School Professional of the Year in 2006.



Figure 1. Blocked and random arrangement of four agility drills

BLOCKED	RANDOM
1 Sideshuffle	1 Sideshuffle
2 Sideshuffle	2 Cut
3 Sideshuffle	3 Backpeda
4 Cut	4 Cross-step
5 Cut	5 Sideshuffle
6 Cut	6 Cut
7 Backpedal	7 Backpeda
8 Backpedal	8 Cross-step
9 Backpedal	9 Sideshuffle
10 Cross-step	10 Cut
11 Cross-step	11 Backpedal
12 Cross-step	12 Cross-step

coaching is vital to ensure that this conforms to the key target mechanics for that movement (as outlined in article one). It is important that the athlete is firstly aware of the target mechanics, and secondly develops the ability to perform these movements efficiently and effectively. Additionally, it is important that they develop their ability to detect errors in these mechanics, and appropriate coaching feedback is essential here. It must be remembered that no matter how specific the drill, it will not be effective if the movement patterns are not correct, and quality coaching is vital in establishing these patterns. There are a number of ways in which the coach can optimise their levels of coaching:

- introduce the session
- provide quality instruction
- provide quality feedback

Introducing the session

Athletes are motivated when they see how their work relates to their goals i.e. how is this drill going to make me a better player.¹¹ Whilst the aims of many of the drills may be clear to the coach, the athlete is not always aware of these aims. By relating the drill to how it can affect their performance the coach can enhance motivation and the subsequent adherence to the session.

Providing quality instruction

The level of initial instruction is an important part in any speed and agility programme, as it is vital that the athlete is provided with a general idea of the movement. While providing instruction, the coach must keep in mind that the short term memory is limited to just a few items, estimated at 7 +/- 2⁶ and athletes will only be able to remember a few of the things they hear. The coach should be wary of giving too much information, and should limit their instruction to

one or two key points. Additionally, the way in which the coach gives the instruction is important. Athletes have differing preferred forms of communication, either visual, auditory or kinaesthetic. If a coach can integrate all three of these into their instruction, then they are likely to enhance communication with all of their athletes.⁸ For example a demonstration (a visual instruction) can be supplemented with an auditory instruction (e.g. land on the balls of the feet), and a kinaesthetic element (e.g. feel you are treading on hot coals). The use of consistent terms and cues enhances athletes understanding, and the ability to transfer the term into different situations for example an athlete familiar with the term athletic position will be able to transfer its use across a range of movements.

Using demonstrations

Quality demonstrations are an important tool in a coach's armoury. A quality demonstration provides the ideal medium for the communication of a skill to those with a visual preferred communication style. By integrating verbal and kinaesthetic instruction into this demonstration the coach can enhance the quality of the demonstration yet further. As with any form of instruction, a demonstration can provide too much information, and cueing techniques that direct the athletes attention to important aspects of the demonstrated model are important tools for the coach. These cues will need to become more advanced and precise when working with more advanced athletes.

Guidelines for giving feedback

Feedback will be related to the athletes ability, and it should be remembered that more is not necessarily better. In general, the more developed the athlete the less feedback they will need. However, whilst advanced athletes require less feedback, the precision of this feedback needs to be much greater, as more precise performance adjustments need to be made. The aim is to produce athletes who are able to consistently monitor their performance, and make adjustments to their performance as and when required. This requires the ability to detect and adjust to key performance information, but this is not always a natural development, unless the ability is developed by effective feedback it will remain undeveloped. To facilitate this, the coach needs to assess the athlete's ability to access important information,³ and shape their feedback appropriately. Via the use of tools such as movement related questions, the coach should be able to determine the athlete's ability to detect and correct errors and in this way can determine the type and quantity of feedback needed.

In the early stages, the key is to give the athlete

general information about the movement, and their patterns of actions within this framework.¹⁵ The aim of this process is to progressively develop the athlete's abilities of error detection and correction, and this requires the coach to draw an athlete's attention to the key elements of performance. Given the limit of the short term memory feedback⁶ should be restricted to one or two points, and should focus on the major limiting factor within current performance.¹⁴ In general, a good guideline for feedback is that it should be clear, direct and limited to avoid information overload. The feedback should also be directed at factors within the athletes control, such as foot positioning, centre of gravity etc. Prescriptive (offering suggestions) as well as descriptive feedback is effective at enhancing performance.¹⁰

As the athlete's abilities develop, then the frequency of feedback will reduce,² to a point at which it will only be needed when an athletes quality of performance falls outside a prescribed range. In these situations, feedback will be increased until performance quality again falls within the range of tolerance.¹⁰ As athletes develop and their movement become more automated, attention will need to move to key environmental aspects that dictate effective sport specific performance such as the movement of an opponent,⁵ as this is more conducive to skill development at this level.^{4,12,13,16} These will often be the key stimuli to which as athlete will need to read and react to within their activity. This is best developed via the use of specific random drills.

Throughout, the quality of feedback given will be dependent upon the coach's own error detection capacities. It is therefore vital that the coach has a thorough knowledge of the target movement patterns and the target mechanics required for optimal performance.

A Long Term Agility Development Model

To facilitate effective program design, a pyramid development system can be utilised which comprises three levels:

1. Foundation
2. Development
3. Peak

At the bottom of the pyramid is the **foundation** level, this broadly corresponds to the Cognitive (verbal-motor) phase of motor development which is the first stage in the learning of any skill.¹ At this time, the coach will often be introducing novel tasks, with the athlete needing to develop a general idea of the movement.⁴ This phase needs to develop the fundamental target movement patterns, and their associated target mechanics. The patterns developed at this stage will transfer well to the more advanced work to come later, and success at this stage will enhance

performance at subsequent levels. Failure to develop these patterns and mechanics will always compromise future performance. As many sports rely on the same target movement patterns, then general agility classes can be employed at this time, and classes like this can be effectively introduced into school classes. Guidelines for constructing foundation level sessions are given below:

- Develop the key discrete movements of the sport.
- 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.
- Target only one area during feedback.
- Use distributed practice to minimize fatigue.
- Blocked practice can be used initially but following this initial period random practice should dominate.

The next level of the pyramid is the **development** level. This broadly corresponds to the Associative (Motor) phase of motor skill learning. This is the second phase of learning, where learners develop motor patterns.¹ It is important that this is only entered once the base level has been successfully completed, as the target mechanics and movement patterns form the basis of successful motor patterns. This phase needs to develop the ability to combine the basic movement patterns into the movement combinations of the athlete's sport. This is initially achieved via the use of closed drills such as bag drills, cone drills etc. As the drills become more sport specific, they need to identify key elements of the target movement patterns such as the movement combinations, the aims of each part of the combination, the directions distances and speeds of movement for each combination, which can then be utilised in the construction of appropriate drills.

Additionally, the coach should increasingly integrate sport skills such as using a hockey stick to increase sport transfer. As the phase continues there will be a gradual move towards more random (open) drills. Athletes will be seen to have completed this stage when they are able to produce effective, efficient, consistent and fluid movement patterns in a wide range of closed and open situations, with little need to focus on the movements themselves. Guidelines for constructing development level sessions are given below:

- Focus on the key movement patterns and transitions 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.
- Reduce the quantity of feedback, whilst increasing its precision.
- Challenge athletes to monitor their performance via questioning in feedback.
- Practices should be randomly distributed and include variance.
- Drills should be increasingly performed in the target context.

At the top of the pyramid is the **peak** level, which broadly corresponds to the autonomous stage of motor skill development, where movements are largely automatic.¹ Success in this level is based upon success in the previous levels, and the rush to perform drills characteristic of this stage is a major mistake. At this time, drills aim to express the potential of the previous levels, and there is in reality little difference between agility drills and the exact requirements of the sport. The coach needs to utilise sport specific drills, including read and react drills, performed in the target context (i.e. the sport specific environment). Movement focus can now be on the sport skills and the key reaction stimuli, in the knowledge that the basic movement patterns are being performed autonomously, via efficient motor programs. Guidelines for constructing peak level sessions are given below.

- Use a variety of complex open drills.
- Drills should be highly sport 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.

Conclusion

By aligning the agility development programme with the principles of motor learning coaches can provide their athletes with the best possible learning environment. In this way, a long term development programme is essential, as the

ultimate quality of movement will depend upon the quality of the target movement patterns. At all times, coaches should be aware of the influence they have on the development of agility and how quality coaching can provide for the ideal learning environment.

References

1. Adams, J.A. A closed loop theory of motor learning. *Journal of Motor Behaviour*. 3, 111-150. 1971.
2. Bruchert, L.R., Lai, Q. and Erbaugh, S.J. Reduced feedback frequency enhances error detection. *Research Quarterly for Sport and Exercise*. 73(1) A46.2002.
3. Flach, J.M., Lintern, G. and Larish, J.F. Perceptual Motor Skill A theoretical framework. In Warren R and Wertheim, A.H. (eds) *The perceptions and control of self motion* (pp 327 - 355) Hillsdale NJ: Erlbaum. 1990.
4. Guadagnoli, M., McNevin, N. and Wulf, G. Cognitive influences to balance and posture. *Orthopaedic Physical Therapy Clinics of North America* 11, 131-141.2002.
5. Liu, J. and Wrisberg, C.A. The effects of knowledge of results delay and the subsequent estimation of movement form on the acquisition and retention of a motor skill. *Research Quarterly for Exercise and Sport*. 68: 145 -151. 1997.
6. Miller, G.A. The magical number seven. plus or minus two. Some limits on our capacity for processing information. *Psychological Review*. 63. 81-97 1956.
7. Prinz, W. Perception and action planning. *European Journal of Cognitive Psychology*. 9: 129 - 154 1997.
8. Ready, R. and Burton, K. *Neuro-linguistic Programming for Dummies*. Chichester, England: Wiley. pp 88-96. 2004
9. Schmidt, R.A. and Wrisberg, C.A. *Motor Learning and Performance* (3rd ed.). Champaign Ill: Human Kinetics. pp 183 – 275. 2004.
10. Schmidt, R.A. and Lee, T.D. *Motor Control and Learning: A Behavioural Emphasis*. Champaign Ill: Human Kinetics. pp 302 – 458. 2005.
11. Weinberg, R. S. and Gould, D. *Foundations of Sport and Exercise Psychology*.(Second Edition) Champaign Ill: Human Kinetics. 1999.
12. Wulf, G., Hoã, M. and Prinz, W. Instructions for motor learning. Differential effects of internal versus external focus of attention. *Journal of Motor Behaviour*. 30: 169-179. 1998.
13. Wulf, G., Lauterbach, B. and Toole, T. The learning advantages of an external focus of attention in golf. *Research Quarterly for Exercise and Sport*. 70: 120-126. 1999.
14. Wulf, G., Shea, C. and Park, J.H. Attention and motor performance; Preferences for and advantages of an external focus. *Research Quarterly for Exercise and Sport*. 72(4) 335-344. 2001.
15. Wulf, G., McConnel, N., Gartner, M. and Schwarz, A. Enhancing the learning of sport skills through external focus feedback. *Journal of Motor Behaviour*. 34, 171-182. 2002.
16. Wulf, G. Feedback and attentional focus. *Research Quarterly for Exercise and Sport*. 73 (1). A42 2002.

UKSCA Assessment days

Since early 2005 we have run over 13 assessment days around the country through which over 170 individuals have been assessed. For the latest list of scheduled venues and dates please see the website or contact the office.

UKSCA Course and training development

Over the last year more than 140 members have taken part in our 2 day workshop to develop their competencies in weight lifting technique coaching. Dates for the 2007 workshops can be found on the website and we will soon be announcing the launch of a new workshop in speed and plyometric coaching techniques. We are also working with other bodies to develop courses and training opportunities to meet their specific needs.