

SKILL ACQUISITION FOR COACHES

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Appropriate organisation of practice, and the ways in which you provide feedback are pivotal to improving skills.

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Key sections:

- Introduction
- Structuring the practice environment
- The nature and administration of feedback
- Attentional focus
- Conclusion

INTRODUCTION

As active human beings we hardly ever stop moving. Most of these everyday movements are initially acquired with the help of parents or teachers, while others we gain through trial and error. In sporting situations, many of these basic movements act as foundational skills for more complex actions that may take years to master. The effectiveness of the coach in facilitating the learning of such skilled movements can be enhanced through a more detailed understanding of how athletes learn and how best to structure the environment to support this learning. How people learn to execute skills effectively poses an interesting set of questions, questions that researchers continue to wrestle with in an attempt to illuminate the sometimes misty world of effective coaching. The aim of this chapter is to discuss some of these questions and to illustrate the value to coaches of knowledge about the acquisition of skills. Further, it seeks to provide a framework for understanding and applying that knowledge that will, it is hoped, have a positive impact on the coaching and learning experience.

Schmidt and Wrisberg (2000) recently developed an academic road-map for providing instructional assistance. The upper layer of their map or model guides readers to a number of open-ended questions relevant to addressing skill acquisition and subsequent performance issues. These include: Who is the learner? What is the task the person must perform? and, What are the conditions under which the performer wants to be able to perform? Although this information is critical, most coaches seldom ask such questions as they appear to implicitly understand athletes, the sport and their requirements. Consequently, our objective in this chapter is not to examine individual differences between participants and across tasks, but to concern ourselves with the second layer of Schmidt and Wrisberg's model – the learning experience. Specifically, we will examine three aspects of this experience to illustrate how coaches can (a) structure the practice environment, (b) provide effective feedback, and (c) identify an appropriate attentional focus (i.e. what one should concentrate on) for performers whilst executing motor skills. For each of these areas we present the main principles and contemporary research findings and discuss the application of this knowledge. Finally, we conclude with a brief summary that brings together the main points raised.

STRUCTURING THE PRACTICE ENVIRONMENT

Often, the time constraints placed upon coaches require them to teach more than one skill in a single training session. Thus, most sessions demand that athletes practise a number of activities. In football (i.e. soccer), for example, a training session may well include the practices of dribbling, crossing and shooting. Therefore, it is important that coaches understand how to schedule different activities within a training session so that learning is maximised. Two types of practice scheduling that have been widely referenced within the skill acquisition or motor learning literature are blocked and random practice (see Magill 2004).

Blocked versus random practice

Blocked practice can be defined as a practice schedule in which the performer repeatedly rehearses one task before moving on to another. It is typically observed in repetitive drills and is often adopted by coaches as it is seen as allowing the learner to refine and, if necessary, correct a skill before beginning another. For example, a squash coach wanting to teach the forehand, the backhand and the serve in one session would choose to devote a fixed block of time to practise each on the premise that the uninterrupted time on one task will cement the movement skill into the learner's memory. Alternatively, in a random practice schedule the session is structured so that the learner practises a variety of skills in no particular sequence. Here the coach organises the practice session so that there is large variation in skill rehearsal, i.e. the athlete alternates amongst the skills to be learned in an assorted or intermingled fashion and, in extreme cases, never practises the same skill consecutively.

An important misconception between these two practice schedules is that because blocked practice often leads to more proficient performance during training, it also leads to greater learning (i.e. the retention and/or transfer of skills over time). However, research investigating practice scheduling challenges this, and actually reports greater learning when practice occurs in a random, rather than a blocked, sequence (e.g. Bating 1966, 1979; Lee and Magill 1983; Perez et al. 2005). This counter-intuitive pattern of results – that is, where conditions of practice associated with poor performance also lead to better learning – has been termed the contextual interference effect. This phenomenon has been explained using a variety of theories, but the two most commonly cited are the action plan reconstruction hypothesis (Lee and Magill 1985) and the elaboration hypothesis (Shea and Zimny 1983).

According to the action plan reconstruction hypothesis, continually reconstructing a plan for new movement, as occurs in random practice, undermines performance. However, since the learner has devoted more mental effort to developing a memory representation for each skill (i.e. remembering how to do), learning is enhanced. In essence, the extra cognitive effort required for random practice enables the performer to create a library of action plans in memory and to retrieve the appropriate one to meet specific task demands at a later date (e.g. during a game situation). Conversely, in blocked practice, a given action plan can be constructed on the first attempt of a movement skill and simply applied to subsequent attempts over an entire block of trials. This uninterrupted repetition of the same action plan leads to good performance during practice, but the minimal experience learners have in reconstructing action plans means that applying that learning in a variety of contexts is poorer.

The principal idea behind the elaboration hypothesis is that random practice forces the learner to engage in a variety of cognitive processing activities, the result of which means information about each to-be-learned skill is more distinctive. That is, when the learner switches from practising one skill to another during random practice, they compare and contrast the separate tasks, which results in the establishment of more meaningful or distinctive memories, thus making retrieval easier at a later time. In contrast, the continued repetition of a single skill in blocked practice does not provide the learner with the opportunity to engage in such cognitive activity. Therefore, learners develop less distinctive memory representations of each practised skill.

Factors influencing the contextual interference effect

Although there is a large body of research supporting the contextual interference effect, it is not a completely robust phenomenon and does not apply in all situations. Thus, the degree to which the contextual interference effect influences skill learning may depend on a number of individual and task-related factors (Magill and Hall 1990). The two most probable individual factors here appear to be age and skill level. Experiments utilising children as participants are rather limited, but those that have been conducted have failed

to find greater skill retention under conditions of random practice (Del Rey et al. 1983; Pigott and Shapiro 1984). Similarly, in a recent review of the literature it was concluded that practice schedules of lower contextual interference (i.e. blocked practice) led to greater skill learning in children (Brady 2004). With regard to the skill level of the learner, it has been observed that individuals with very low skill levels perform better on a retention test when subject to blocked practice (Herbert et al. 1996), whereas it is more beneficial for higher-skilled performers to experience random practice (Hall et al. 1994). Although these findings are at odds with the contextual interference effect, they can be explained by the performers' stage of learning and the practice schedule adopted (Cuadagnoli et al. 1999). For example, in the early stages of learning, athletes often struggle to understand the movement to be learned (Gentile 1972, 2000). In an attempt to do so, they simplify the required task's demands by trying to reduce the number of potential moving body parts involved in the skill (Fitts 1964; Bernstein 1967). Thus, constructing the learning environment to include high levels of contextual interference at this stage of learning may be overwhelming and may actually interfere with the development of a stable action plan for movement (Wulf and Schmidt 1994). Therefore, before progressing to random practice, children and beginners alike may need time to explore and develop the basic required co-ordinated pattern of movement (Gentile 1972, 2000).

In relation to task factors, Magill and Hall (1990) hypothesised that the beneficial learning effects associated with practice schedules that include high levels of contextual interference are more consistent when the skills practised are controlled by different generalised motor programmes (GMPs) (Schmidt 1975, 1991). A GMP is essentially a memory mechanism that a learner uses to control particular actions, such as throwing, kicking, catching, and jumping, that have common (i.e. the rhythm of the movement, in terms of timing, force, and the order of the components) yet unique features (i.e. the overall timing and force of the movement). Therefore, according to Magill and Hall (1990), when the learner practises a number of movement skills that require different patterns of co-ordination adopting a high, as opposed to a low, level of contextual interference within the practice schedule, better learning will result. However, if the practised skills are generally similar or from the same GMP (i.e. swinging the same golf club to hit the ball different distances), then a practice schedule with a high level of contextual interference will not benefit learning over one with a low level of contextual interference.

Constant versus variable practice

If random practice benefits the learning of skills from different GMPs, how would a coach structure a practice environment to enhance the learning of a variety of movements from the same class of actions or GMP? One option is to ensure that only one variation of the skill is practised in any one session (i.e. throwing a ball to a single, unchanged target that is always positioned the same distance away). This type of practice schedule is not dissimilar to blocked practice and is often referred to as constant practice. However, if the learning goal is to produce a number of versions of the same skill, then it is important to have

learners practise different versions of the action in each practice session; something referred to in the literature as variable practice. Indeed, research has consistently demonstrated the learning benefits of variable over constant practice, both in laboratory tasks (Shea and Kohl 1990, 1991) and in experiments involving sports skills (Shoenfeld et al. 2002).

To summarise this section, whatever the skill to be learned, coaches should be aware that it is important to introduce practice variability into sessions, and also to organise the practice environment according to the principles of contextual interference. Although practising under conditions of high contextual interference (i.e. random practice) does not always lead to immediate good performance, research suggests that it often leads to better long-term skill learning. However, the level of contextual interference that is likely to lead to optimal learning depends on a number of task and individual factors, namely: whether the to-be-learned tasks are from the same or different CMAPs, and the age and skill level of the learner. Finally, while there is no agreement as to how the structure of the practice environment influences skill learning, both the action plan reconstruction and the elaboration hypotheses concur that making practice more cognitively demanding (i.e. making individuals work problems out for themselves) forces athletes to process skill-related information in a more active and independent manner that, ultimately, facilitates learning.

THE NATURE AND ADMINISTRATION OF FEEDBACK

Augmented feedback is information provided to the learner from an external source. It is the general term used to describe information given about the performance of a skill that enhances the intrinsic feedback that is naturally available from performers' senses (i.e. their auditory, proprioceptive and visual systems). Augmented feedback can be provided verbally or non-verbally, during (concurrent feedback), immediately following (terminal feedback), or some period after the completed skill (delayed feedback), and can include information about the movement outcome (knowledge of results [KR]) and/or the movement pattern (knowledge of performance [KP]).

From the coach's perspective, the most important question when considering whether to use augmented feedback is: can it help in the acquisition of the to-be-learned skill? Unfortunately, the answer to this question is not simple as (similar to the earlier discussion on how to best structure the practice environment) it is dependent on both individual and task factors. Firstly, there may be situations where augmented feedback is not required, as the task-intrinsic feedback alone provides sufficient information for skill learning to occur. In these situations, athletes can make appropriate future adjustments to their movements based on their own sensory feedback from either their individual performances or by observing others of the same (Herbert and Landin 1994), or higher, skill level (Magill and Schoenfelder-Zohdi 1996). However, if athletes cannot utilise intrinsic feedback to enhance their performance, then augmented feedback is essential for skill acquisition. This situation can occur due to a number of reasons, such as injury, task constraints and skill level. For example, when an individual who, through injury, has damaged essential mechanisms for

the detection and/or utilisation of task-intrinsic feedback, or where the constraints of the task mean that critical intrinsic feedback is not readily available, augmented feedback must be presented if learning is to occur. In addition, there may be situations where task-intrinsic feedback is readily available, yet it is not immediately useful to the learner due to his or her limited experience in perceiving its meaning. These situations often occur during the early stages of learning. Here, then, augmented feedback can help the novice learner better understand the meaning of the task-intrinsic feedback. However, this process can sometimes be problematic as, if the task-intrinsic feedback is minimal or perceived as overly difficult to understand, augmented feedback may actually reduce learning. This occurs if the learner substitutes the intrinsic feedback with the offered augmented feedback, subsequently becoming reliant on the latter for accurate performance. Consequently, when augmented feedback is not available, such as in a game situation, a decrease in performance is likely to occur. This is referred to in the motor learning literature as the guidance hypothesis (Salmoni et al. 1984) and will be further discussed later in this chapter.

Types of augmented feedback

Verbal feedback provided by coaches is perhaps the most commonly used form of augmented feedback in the practice environment. However, there are a number of other ways of providing augmented feedback. An increasingly utilised form is through video. However, for videotape feedback to be effective at least two important factors need to be considered: the learner's skill level and the period of time for which this type of feedback is utilised (Rothstein and Arnold 1976). Here, research suggests that skilled performers benefit from unaided video replays of their performance, whereas novices tend to be overwhelmed by the information available in the video and require the addition of specific verbal cues to point out critical information (Newell and Walter 1981; Rothstein and Arnold 1976).

Research has also suggested that learners need sufficient time to familiarise themselves with video replays as a form of augmented feedback so they can understand what information is important to extract and act upon. Whilst it may be possible to reduce this time period by providing attention-focusing cues as described above, it has been recommended that video replays should be utilised for at least five weeks in order to become an effective teaching/learning tool (Rothstein and Arnold 1976).

Another useful form of augmented feedback is biofeedback. Here information is presented to the athlete about internal physiological actions such as heart rate, muscle activity and/or joint movement. This form of augmented feedback is generally used in the clinical setting for the purpose of rehabilitation (Brucker and Bulavea 1996; Intiso et al. 1994; Shumway-Cook et al. 1988). However, it has also been used in the sporting environment to enhance the learning and performance of both skilled swimmers, by providing audible signals about their stroke rate (Chollet et al. 1988), and elite rifle shooters, by providing audio signals enabling them to shoot between potentially disruptive heartbeats (Daniels and Landers 1981).

The frequency and timing of augmented feedback

While the skill level of the performer and the characteristics of the task need to be taken into account when deciding if and what type of augmented feedback is required for skill learning, it is also important to consider the amount and frequency of such feedback as well as its timing (i.e. when it should be given). Early views regarding the presentation of augmented feedback suggested that 'the greater the amount the better the learning', and that it should, therefore, be presented after every practice. However, this view is no longer tenable following the emergence of the guidance hypothesis (Salmoni *et al.* 1984). According to the guidance hypothesis, if the learner receives augmented feedback after every trial they may develop a dependency on it, thus undermining the benefits of important intrinsic sensory feedback required for error detection and correction (Bjork 1988, Schmidt 1991). Consequently, when augmented feedback is not available, performance suffers, as the learner has come to rely upon it to produce the required skill effectively. A number of studies have been carried out examining augmented feedback using a variety of techniques (e.g. Winstein and Schmidt 1990, Janelle *et al.* 1995), the results of which appear to support the guidance hypothesis. Specifically, the research indicates that low-frequency feedback schedules are advantageous to skill learning because they promote problem-solving and encourage learners to explore the dynamics of a skill while utilising task-intrinsic feedback.

A common misconception with regard to the timing of augmented feedback is that it should be provided as soon as possible after completion of the practice trial, because any delay results in the learner forgetting the skill. Research, however, does not support this. Rather, it has demonstrated that there must be a minimum time period given to the learner before augmented feedback is presented (Swinnen *et al.* 1990). This is in accordance with the principles of the guidance hypothesis, which suggests that if the KR delay is too short the learner is unable to fully engage in important intrinsic error detection and correction mechanisms, thus compromising the learning.

A second important timing issue relates to the interval between the presentation of augmented feedback and the beginning of the next practice trial (the post-KR delay). Whilst there is no evidence indicating an optimal period for this interval or an upper limit, the general conclusion is that it can be too short (Callagher and Thomas 1980, Rogers 1974). This is because the learner requires sufficient time to process both the augmented feedback and the task-intrinsic feedback from the previous trial to produce an action plan for the subsequent response. Thus, for optimal learning, the post-KR delay should be long enough to permit these important learning processes to occur.

To conclude, primary considerations when using augmented feedback are to assess both the characteristics of the learner (e.g. the skill level) and the nature of the to-be-learned skill (i.e. the amount of available task-intrinsic feedback during execution of the skill). These will determine what role additional feedback could play in learning (e.g. is it necessary for learning to occur?). If augmented feedback is deemed necessary for skill learning, a number of different types of presentation techniques are available to the coach. These include verbal, video replays and biofeedback, the merits of which again depend on individual and

task factors. For example, video replays are particularly useful to skilled performers (Rohstein and Arnold 1976), although in order to be effective for beginners, videos should be supplemented with cues designed to focus the learners' attention on critical aspects of the skill (Kernodle and Carlton 1992, Newell and Walter 1981). Finally, in line with the guidance hypothesis (Salmoni *et al.* 1984), the frequency and timing of presenting augmented feedback should be considered in order to facilitate optimal learning.

ATTENTIONAL FOCUS

The first two sections of this chapter have looked at ways in which the learning environment can be manipulated to facilitate learning. The third will focus specifically on the instructions given to learners regarding their focus of attention, the objective of which is to help them produce the appropriate action to realise the desired movement goal. The question of what learners should concentrate on when executing motor skills has received a good deal of recent attention. Traditionally, learners have been given instructions to direct attention towards aspects of the required movement and the co-ordination of their body to achieve it. It has long been assumed that making learners aware of what they are doing is a requisite for successful performance (Baumeister 1984). Indeed, underpinned by research in the field of sport psychology (e.g. Kingston and Hardy 1997), performers are frequently persuaded to adopt a process or task focus, which encourages them to pay explicit attention to technical aspects of the skill. This, it is argued, will enable them to successfully complete the skill. Such instructions, however, are being increasingly questioned in the context of learning and coaching (Baumeister 1984, Hardy *et al.* 1996, Jackson *et al.* 2006, Masters 1992, Mullen and Hardy 2000). Indeed, there is mounting evidence suggesting that instructing performers to be consciously aware of their body movements during skill execution is not a very effective learning strategy, and can actually undermine performance. Wulf and her colleagues (see Wulf and Prinz 2001 for a review), for example, demonstrated that directing learners to focus on their body movements, i.e. inducing an "internal" focus of attention, resulted in no learning benefits or even in learning decrements, relative to not giving learners instructions at all (McNevin *et al.* 2003: 22). Others, however, continue to espouse the merits of giving athletes the what and how of a particular skill to be performed (Masters 2000). The obvious question arising, therefore, is what should athletes be directed to focus upon in order to facilitate learning and the execution of complex sport skills?

Support for an external focus of attention

One reasonable objective for a coach is to help athletes execute skills in an automated fashion because this is the most efficient manner to perform (and characterises many expert performers). However, because attempting to perform a skill as though it were automatic is very difficult for beginners, Singer (1985, 1988) proposed a five-step approach (Ready, ing, Imaging, Focusing, Executing, Evaluating) to help learners maintain a desired process or task

focus, yet distract them from their own movements. The important point here is that, while having the athlete mentally imagine the act before executing it promotes awareness (self-focused attention), the cues used to focus attention need to be external (e.g. the dimples of a golf ball, the anticipated trajectory of a basketball), thus taking attention away from the required movement pattern (Wulf et al. 2000). Similarly, related research into the efficacy (i.e. the performance benefits) of using internal cues indicates that, contrary to traditional beliefs (and in comparison to not focusing on how to perform the required skill), 'instructing learners to focus on the details of their movements during performance can be detrimental to performance and learning' (Wulf et al. 2000: 230). In expanding and refining this line of research, Wulf and colleagues found that directing learners' attention to the effects of movements (i.e. the result of kicking a ball) was more effective than focusing on the movements themselves. Indeed, in Wulf's tennis-forehand experiment, she found specific learning benefits for those instructed to focus on the anticipated trajectory of the ball (the movement effects) as opposed to the action of hitting the ball itself. A possible explanation for these benefits is provided by Prinz's (1997) action effect hypothesis, which suggests that actions are planned and controlled most effectively by their intended effects.

In order for coaches to buy into using external foci of attention, it is important to justify why the proposed benefits of doing so may occur. According to Wulf et al. (2000), focusing on the effects or the consequences of movement allows unconscious control processes to take over. This results in more effective performance and learning than would occur if individuals consciously tried to control their movements or concentrate on something else. Similarly, McNevin et al. (2003) argued that consciously intervening in movement production is likely to disrupt the co-ordination of a number of relatively automatic (reflexive and self-organising) processes that normally control the movement, further supporting the efficacy of unconscious control processes in learning and controlling movements.

The negative self-focused attention effect is not exclusive to beginners. Masters (1992) suggests that under certain conditions (e.g. elevated levels of stress) the automatic control processes utilised by expert performers are overridden by the desire to ensure task success. He coined the phrase 'conscious processing' to describe this behaviour. In such cases, individuals adopt a mode of control primarily associated with the early stages of learning (Fitts and Posner 1967), resulting in less effective performance.

While the learning and performance benefits of using an external focus of attention appear robust, McNevin et al. (2003) proposed that the advantages of doing so were more profound and appeared earlier in the learning process as the distance of the external focus from the body increased. This was because, at a distance, such foci are more easily distinguishable from the body movements that produce them and, hence, facilitate the utilisation of more natural control processes. These suppositions, however, seem to contradict the results of a second experiment by Wulf et al. (2000) using a golf chip-shot task. They found that performers focusing on the swing of the club (a proximal [close to the body] focus) experienced performance and learning benefits compared to those who focused upon the anticipated trajectory of the ball and the target (a distal [away from the body] focus). In trying to explain this apparent anomaly, the authors suggested that focusing

upon the club movement (less distal) produced better learning as it provided the learners with more salient information regarding the movement technique (Wulf et al. 2000; Wulf and Prinz 2001). This indicates that complete novices who have yet to grasp the fundamentals of complex tasks may, therefore, benefit from some form of self-monitoring of the action, such as focusing on the details of their movements during performance (Perkins-Ceccato et al. 2003).

Practical implications

So what does all this mean for coaches? We will now summarise the implications of the preceding discussion and provide some guidance for coaches in relation to attentional focus while considering the broad skill level of those being coached and the complexity of the task itself. The weight of evidence currently suggests that there are benefits to learning motor skills in the absence of internal or self-focused attention on the desired body movements. This internal focus leads to a build-up of explicit rules about task performance that has the potential to hinder learning (Hardy et al. 1996; Poolton et al. 2006). Furthermore, Liao and Masters (2002) provided evidence that learning under self-focused attention appears to lead to more vulnerable (i.e. weaker) performance under stress. Therefore, it is necessary to identify coaching techniques that minimise the tendency of athletes to engage in self-focused attention.

An implicit or unconscious learning strategy, by definition, encourages the development of implicit (non-verbalisable) knowledge that is unavailable to consciousness. Learning under such conditions negates the potential for poor performance due to self-focused attention because there are no explicit rules for self-focused attention to access. One strategy to promote implicit learning is to coach by analogy. The objective of analogous coaching is to encourage athletes to perform the skill being learned using a general analogical rule that acts as a movement metaphor and that, by default, incorporates the technical rules necessary for successful execution of the skill (Masters 2000). For example, the top-spin forehand in tennis can be taught by using the right-angled triangle as an analogy. The learner is asked to imagine following the outline of the triangle using their racket from the preparation of the racket head at the highest (acute) point of the triangle to dropping the racket to the ninety-degree angle, before drawing back along the base of the triangle in order to strike the ball as the racket head returns squarely to the hypotenuse. Embedded within the analogy are many of the rules often associated with teaching this stroke to beginners. Similarly, learner golfers might be asked to replicate the grip used on a hand-axe (in carrying out a chopping action) when being taught the position of the lower hand (right hand for right-handed golfers) of the golf grip. The key with analogies is for the coach to be creative while the metaphor itself should be clearly understood by the athlete.

While analogies give learners the general idea of the movement without the use of explicit rules, they may not enable the learner to garner sufficient information to evaluate effectively and then alter an unsuccessful performance (Bennett 2000). Consequently, for more

complex skills it may be important that learners have a knowledge of the fundamentals of the skill to be performed in order that they can monitor and evaluate their performance effectively should problems arise. For example, Bennett illustrated (in golf) the value of some fundamental knowledge associated with the stance and club-head approach that would enable a slicing golfer to make adjustments to remedy that problem. Such fundamentals can be taught by coaches through facilitating an intrinsic or kinesthetic (i.e. bodily movement) appreciation in athletes of the desired technique without recourse to explicit rules.

For more capable/skilled performers, coaches can be left in a tricky situation. With too much explicit knowledge, players are likely to be susceptible to negative stress effects caused by conscious processing (Masters 1992). However, without it it is unlikely that players will achieve high levels of performance. A solution is to ensure that players have strategies in place to negate the tendency (under stressful conditions) to use explicit rules inappropriately when attempting to ensure task success (as these undermine rather than support successful task execution). One coping strategy that has received widespread support in this respect is that of pre-performance routines (Jackson *et al.* 2006). These are most relevant in sports that have closed-skill elements (i.e. where the environment is stable, as in golf). Here, absorbing one's self in a given set of behaviours designed to support task performance may provide a means of resisting the effects of self-focused attention.

While there is widespread support for focusing on a set of processes that are chunked together to form a pre-performance routine (see, for example, Boutcher 1990), an alternative strategy is to focus on an isolated aspect of the skill that, if executed effectively, will permit successful performance. This describes what has been coined in the sport psychology literature as a process goal (Kingston and Hardy 1997). However, despite supportive evidence that focusing on isolated aspects of technique might facilitate performance (e.g. Filby *et al.* 1999; Kingston and Hardy 1997; Zimmerman and Kitsantas 1996), such a process focus has been questioned. Primarily it has been challenged on the premise that promoting step-by-step monitoring and control of complex procedural knowledge, which typically operates automatically, results in performance impairment (e.g. Hardy *et al.* 1996; Jackson *et al.* 2006; Masters 1992). Furthermore, and more specifically, Jackson *et al.* (2006) provided strong evidence that movement-related process goals were detrimental to performance regardless of individual tendencies for self-focused attention and situational pressure. However, in line with Kingston and Hardy (1997), Jackson went on to suggest that subtly different process goals may have different attentional functions. For example, process goals that take attention away from the physical movements being performed (e.g. functioning as holistic cues for the desired action) do not encourage explicit monitoring (Jackson *et al.* 2006). To illustrate, holistic-process goals (as distinct from isolated- (or part) process goals), which are less rule-based representations of the to-be-performed skill (for example, holistic process goals describing the 'whole' movement could take the form of 'smooth', 'extended' or 'controlled') may encourage performers to execute skills using more automatic control structures (Jackson *et al.* 2006). Finally, more global strategies to reduce the tendency for performers to engage

in self-focused attention during potentially stress-inducing situations might be to promote trust (Moore and Stevenson 1994) and self-confidence. The issue of developing self-confidence is examined in greater depth in Chapter 3: 'Psychology for coaches'.

In closing this section on attentional focus, it is important to acknowledge that this area of research continues to develop. What we have attempted to do is highlight a body of research that brings into question traditional notions of coaching where athletes are instructed to focus on their movements while executing skills. It is equally clear that subtle differences in athletes' focus of attention can have significant effects on both learning and performance. Furthermore, these effects vary (and in some cases will produce the opposite to the desired effect) according to the skill level of those to whom the instructions are given.

CONCLUSION

The aim of this chapter has been to identify the current state of play regarding three of the central issues pertinent to the acquisition of skills as specifically related to what Schmidt and Wrisberg (2000) coined the learning experience. For each, a contemporary review of relevant literature was presented, accompanied by an illustration of how this knowledge can be applied by coaches. Broadly speaking, we have tried to illustrate how learning has the potential to be facilitated by a number of factors. These include: practice schedules that promote cognitive (mental) activity; the appropriate use of certain types of feedback, with particular consideration given to frequency and timing; and the utility of an appropriate focus of attention that encourages learners to allow natural control processes to run free. Although we believe such suggestions provide lines of good practice in relation to skill learning, it is important to remember that coaches still need to consider carefully the characteristics of both the individual performer and the task to be performed in structuring optimal learning environments.

REVIEW QUESTIONS

1. Why is random practice important for developing skills? What are the reasons for its positive effects?
2. The use of augmented feedback should be tailored to the individual athlete and the specific task in question. Discuss with reference to the types, as well as the frequency and timing, of such feedback.
3. Why is it important for coaches to promote a focus of attention that allows natural control processes to run free?