# Challenging Traditional Practice Approaches to Skill Development

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The provision of instruction and feedback and the organisation of practice are the most influential tools available to a coach trying to guide an athlete's skill development. This article will focus on a number of the key factors a coach needs to consider when designing a practice session.

## Is it Learning or Performance?

One aspect of skill development that leaves all coaches uneasy is whether their swimmer has genuinely learned the technique being coached, implying a permanent change in the swimmer's skill, or whether they have simply made a transient improvement that will disappear before the next practice session. This can be referred to as the learning or performance issue and understanding the difference between these terms and how they interact with different practice approaches is critical to successful skill development.

Learning is regarded as a permanent improvement in the capability to perform a skill as a result of practice, suggesting that some underlying mechanisms (e.g., muscle mechanics, nervous system control) have been developed. In contrast, performance is simply skill execution at a particular moment in time (not permanent). It can be highly variable and sensitive to conditions such as fatigue, environmental conditions or coach instructions (see Magill, 2004). Quite often when practice is devoted to a particular skill, rapid progress is seen over the session due to the strong feedback and practice emphasis provided by the coach. At the end of the session it is often concluded that the swimmer has learned the skill. Yet the reality is that they improved their performance of the skill and a true assessment of learning cannot occur until a later training session when the impact of the coach's instruction and practice focus has dissipated; for example does the skill hold in a competition setting?

## Practice Volume and Repetition

Swimming coaches know better than anyone that there is a positive relationship between the volume of practice completed and successful skill learning. There are many theories and "urban myths" centered on how much repetition is required for a skill to be learned. Anders Ericsson's theory of deliberate practice is an excellent example. Ericsson proposes that expertise in a given domain can be explained by the accumulation of 'deliberate practice' or the time spent performing a "well defined task with an appropriate difficulty level for the particular individual, informative feedback, and opportunities for repetition and corrections of errors." Furthermore, it is suggested that 10,000 deliberate practice hours are necessary to reach expert status in the sport or skill practiced. While there is no doubt that extensive deliberate practice is required, there is still great debate on the specific nature of this practice (See Farrow et al. 2008 for more discussion). This theory has also been misinterpreted by many and it is commonplace to hear practitioners citing the need for 10,000 practice repetitions to become an expert performer. Irrespective of myth or reality, focus on such a theory only provides guidelines for the volume of practice required but doesn't really assist coaches with the micro-planning of a practice session where the specific organisation and content of practice trials may actually generate different skill learning rates and subsequently alter the volume of practice required.

## Repetition Without Repetition

How a coach organises and distributes practice repetitions within a session has a profound impact on how much learning occurs. While a popular coaching adage is 'practice makes perfect', skill acquisition practitioners have a different mantra, 'repetition without repetition'. That is, it's not the repetition of an identical movement pattern over each practice opportunity that generates learning, rather its practice approaches that force a swimmer to adapt their technique as required to achieve a consistent outcome goal. This suggestion to encourage adaptability can often be misunderstood when examining a sport such as swimming where the majority of skills are relatively closed and repetitious and where having reproducible technique is seen as

critical to performance success. How could exposing a swimmer to practice variability be beneficial? Surely, it would make more sense to practice the skill in exactly the same manner in which it will be performed.

There is a long history of skill acquisition research that has examined this issue and found that even for closed skills like those in swimming, that it is valuable to expose a learner to practice variability so they are required to adapt their technique to meet their task objective. An important issue associated with adopting a practice approach that forces the swimmer to engage in active problem solving, rather than passive practice, is that it can often lead to highly variable skill execution and inconsistent performance outcomes within a given session. Many coaches perceive this inconsistency as a 'negative' and adapt the practice drills to remove the so called 'error', yet this is the very source of the advantage gained from variable practice. Learning is messy! The challenge for coaches is to determine an acceptable range of 'messiness' or what is termed 'functional variability'. That is, practice conditions that promote an acceptable learning rate where the swimmer is suitably challenged but able to achieve the task goal. The accepted range of variability may be narrower as the skill level of the performer increases.

Practice variability can be created in many ways. One of the most well researched and successful methods is the application of a blocked or random practice approach or manipulation of what is called the 'contextual interference effect'. Contextual interference can be equated to the amount of mental effort a learner is required to use when practicing a sports skill. It has been found that the greater the mental effort a learner uses, the better the resultant learning. Random practice involves alternating between two or more skills or variations on each practice attempt. For example, a swimmer may perform one start repetition and then one length of freestyle and then repeat this process, start, freestyle, and so on. Neither the start nor the freestyle action is practiced repeatedly by itself. Alternatively, blocked practice involves practicing one skill continuously for a set of practice attempts before practicing another skill. For example, all starts are completed before performing any freestyle swimming. Research has found that blocked practice leads to better performance of the skills in the short-term compared to random practice. This would seem logical due to a swimmer being able to get into the 'groove' on a given skill during a practice session. However, when the skills are examined over the longer-term to determine whether the training performance is permanent, random practice produces improved retention or learning of the skill.

The reasoning behind these paradoxical effects where blocked practice leads to superior practice performance, but poorer learning than random practice, can be explained by the relative amount of mental effort generated by each practice approach. The need to constantly switch between different skills in a random practice schedule may create higher levels of mental effort than a blocked practice approach. The swimmers are forced to more actively process the skill requirements each time they practice the skill, whereas in a blocked practice schedule the learners can 'switch off' after repeating the same skill a few times in a row.

While the previous explanations make it clear that random practice generates more learning than blocked practice, the characteristics of an individual learner and the purpose of a session impact on the application of the practice schedule in a practical setting.

## Characteristics of the Learner

The skill level and experience of a learner has been found to have a major impact on the usage of random or blocked practice. Specifically, beginners who have no experience or little skill in the tasks to be practiced will benefit more from blocked practice than random practice. It's argued that beginners need the opportunity to get an idea of the movement and establish a basic movement pattern before engaging in random practice. Blocked practice provides this opportunity as the learner can reinforce a desirable outcome or correct an error from the previous practice attempt without the interference of having to change to a totally different skill. This application seems logical if we consider the amount of mental effort a beginner applies to the learning of a new skill. To increase that effort by introducing a high interference practice schedule like random practice would only cause an overload on a beginner's limited processing capacity. However, once a basic movement pattern has been established, the learner should then be exposed to a greater amount of interference so that the mental effort required is increased. Therefore, intermediate and advanced level performers can benefit more from a random practice schedule than a blocked practice schedule.

## It's Not Black and White in Application

Coaches should also be mindful that the practice schedule itself can be manipulated between the extremes of pure random or blocked practice. Although the research has typically investigated changing skills after every trial (random practice) or completing large blocks of trials on the one skill before changing (blocked practice), there are alternatives. For example, it may be desirable to provide a practice schedule that alternates between two different skills or variations after every 5-10 practice repetitions rather than on every trial; therefore, reducing the interference slightly. Likewise, the usage of skill circuits to practice a number of tasks within the one session in blocks of short time periods may be beneficial. Matching the practice schedule difficulty to the current performance

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of the athlete is also a valuable approach. This can be achieved through application of the win-shift / lose-stay strategy otherwise known as the popular schoolyard game 'Donkey'. Put simply, if a swimmer reaches a pre-determined performance time or technical criteria they shift onto the next skill or drill repetition, whereas if they don't reach the cut-off standard they stay and repeat the same drill repetition. Such an approach produces either random or blocked practice dependent purely upon the athlete's performance (see Davids et al. 2008; Farrow et al. 2008; Magill, 2007 for more discussion).

## Skill Breakdown

Another practice issue where the established coaching convention and recent evidence may not be congruent is the issue of part-task practice. It has been promoted for many years that when a skill is high in complexity it is appropriate to break the skill into components and practice independently to reduce the attentional load on the learner. After a period of time the components are then integrated back together as a whole. For example, it is common place to practice the freestyle arm action independent from the kick through use of a pull-buoy. An alternative to this part-practice approach focuses on the notion of simplification, where practice simulates the natural performance conditions as closely as possible but key performance variables are reduced to simplify the task. To use the previous example, the arm and kicking actions are kept as a whole and if needed a flotation device is placed under the torso of the swimmer. Or alternatively, the distance the swimmer must complete in any given repetition is reduced so they can successfully complete the action. The logic behind the simplification approach is that skills need to be practiced more or less in their usual dynamic circumstances where the learner has to functionally integrate the typical perceptual and movement based information. To split this usual integration of information is analogous to the swimmer learning two different skills (see Davids et al. 2008).

## Summary

The aim of this article was to challenge conventional thinking on how practice is organised in a swimming pool environment. In particular, coaches need to be aware of the difference between short-term performance improvement and a true learning gain. Variable practice strategies are likely to require the swimmer to engage more fully in the skill acquisition process and resultant learning is likely to be stronger. Whenever possible it is preferable to keep the skill being practiced as a whole rather than breaking it into parts. It is important to note that the practice approaches discussed may lead to slower rates of skill acquisition than using some traditional coaching strategies. However, like many of the fine things in life, the process of skill acquisition should be given time to mature naturally, for better long-term results. ■



## References and Further Reading

Davids, K., Bennett, S., & Button, C. (2008). The Dynamics of Skill Acquisition. Human Kinetics.

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Magill, R.A., (2007). Motor Learning and Control: Concepts and Applications, 8th edition. New York: McGraw-Hill.