Strength and Conditioning Coaching Practice: What is an Effective Demonstration?

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Introduction

Strength and conditioning (S&C) practitioners often have a number of varied roles they are required to fulfil, including functional movement screenings, performance assessments and programme design. However, the coaching processes by which skills and techniques are taught in order to enhance physical qualities in strength and conditioning settings are often overlooked, and the coach can often be reduced to simply providing encouragement and motivation. Whilst the role of the S&C coach as a motivator should not be overlooked, there is growing evidence within the skill acquisition literature, that as coaches, we should give greater thought to our coaching processes and the type of knowledge we encourage our athletes to obtain. Two forms of knowledge have been identified with regards to motor tasks. Firstly, procedural knowledge, which is the ability to be able to simply perform a task or skill and secondly, declarative knowledge, which is concerned with how the skill is performed and governed by rule based information.[18] Crucially, as coaches we must recognise that declarative knowledge, which is often favoured by coaches, is liable to an effect termed reinvestment, which involves athletes reverting back to a performance level corresponding with a cognitive stage of learning, usually in pressure situations.[10] Several authors argue that this requires coaches to find methods, such as analogies (amongst others), which focus on encouraging our athletes to learn via problem solving processes, with the belief that this will limit potential reinvestment and also encourage greater retention of learning.[7,15,17]

There are a number of coaching tools available to us when working with our athletes, including demonstrations, verbal cues, instructions and feedback; as well as methods of manipulating the practice structure of sessions.[16] Whilst all these variables will impact on the coaching environment, the role of demonstrations is often crucial, and it is rare to see a S&C coach go through a session in either the gym or the field without providing some form of demonstration. This could be a consequence of the importance placed on effective skill production in many coaching qualifications. In an attempt to enhance the skill learning of our athletes, both in the gym and in the field, we must consider the impact our demonstrations of skills have on our learner athletes and in particular the skill level of the demonstration and who provides it.[5]

Many S&C coaches may consider that much of the research into skill acquisition is based around the learning of actual sports skills, such as a pass in football.[18] This is therefore unrelated to the coaching of skills used to enhance performance capacities, such as olympic lifts, which for sports performers, (excluding weightlifters) are simply a modality used to enhance specific physical qualities of an athlete. However, as S&C coaches, we are involved in coaching movement mechanics that do directly transfer to

Key Features of Observational Learning	
Attention	Observers must attend and watch the demonstration.
Retention	The demonstrated performance must be retained in the memory of the learner.
Reproduction	The observer must be able to reproduce and practice the demonstration they have witnessed.
Motivation	The observer must want to retain and reproduce what they have observed.

Table. 1. Description of key features of Observational Learning highlighted by Bandura[3].

performance, such as in agility drills for both field and court based sports. Additionally, due to the importance placed on the long term development of athletes by National Governing Bodies, we must also consider the wider impact of how we coach in the gym, as this will likely have some influence on our athletes and the process by which they become accustomed to learning. The remainder of this article will consider the evidence available with regards to skill acquisition and the skill level of the demonstration presented and will also address the question of who should provide it, with specific reference as to how this may impact on our practice as S&C coaches.

What is the theory behind demonstrations?

The skill acquisition literature also refers to 'demonstrating' as 'modelling', both of which can be defined as "involving the observation of a performance of a skill or action targeted for learning by someone separate to the learner".[18] The ability to learn through watching others was originally highlighted by Bandura[3] in the Social Learning Theory, in which four key elements of observational learning were identified, including attention, retention, reproduction and motivation as outlined in Table 1 *(above)*.

Whilst the focus of this article is on the practical implications of the skill level of the demonstration, and who should provide it, it is also important to note that there are several other features influencing the effectiveness of a demonstration, including when it is given, how often it is provided and the speed at which it is provided, with research showing that often slow motion demonstrations may not provide learners with the required relative motion information to understand the skill effectively. However, slow motion demonstrations may offer a method by which to break down a complex movement pattern, such as an olympic lift..[1,6]

What does the research tell us about who should provide demonstrations?

Before reviewing the available literature regarding who should provide demonstrations, it is important to note that very little evidence actually exists researching strength and conditioning exercises or sports skills. The majority of research has looked at novel tasks, which means we have to infer a great deal from the available research in this area, in order to enhance our coaching practices. It is also important at this stage to define several terms that are used in the skill acquisition literature with regards to the provision of demonstrations. The research reviewed has aimed to establish whether a learning or unskilled demonstration is more effective than a correct or skilled demonstration. A learning or unskilled demonstration is used to mean a demonstration which is an adequate representation of a skill, but one which is developing and does not mean a demonstration which is incorrect or littered with errors. On the other hand, a correct or skilled demonstration refers to a demonstration of a skill, which is believed to meet what is recognised as the ideal technique to perform a skill. The use of a learning or unskilled demonstration is theorised to be effective due to placing fewer constraints on learners and allowing them to establish a solution to a problem which is efficient to them as an individual.[13]

Early research into who should provide demonstrations was conducted by Landers and Landers[8] on a ladder climbing task. They compared the effects of a student or teacher demonstrator who was either skilled or unskilled. Landers and Landers[8] identified that the skilled teacher and unskilled peer provided the most effective demonstrations, which may suggest that it is a combination of who performs the demonstration and the perception of their skill level which limits the effectiveness of the demonstration. Lirgg and Feltz[9] also conducted a similar study, but found differing results, indicating that the most effective demonstrations were provided by either a skilled peer or teacher. The possible reason for these differing results is that in the Landers and Landers[8] study the demonstrators and learners knew each other and were reported as having good relationships, which is likely to have influenced the motivation and attention levels of the learners. What this research appears to highlight is that a skilled teacher or coach led demonstration may be most effective in enhancing immediate skill performance, but that there may also be a role for demonstrations being provided by an unskilled or learner peer who is known to the group of learners. In contrast to research presented up to this point, Pollock and Lee[14] did not observe any differences between improvements in performance seen between a skilled or learning demonstration in a computer game tracking task. However, these results may be explained by the fact the computer based task was extremely limited, involving simply following a cursor around a set out track on the screen.

Crucially, none of the research presented thus far has made use of a retention period. A retention period refers to the stability of learning assessed at a period of time following the initial learning stimulus. McCullagh and Meyer[12] did make use of a retention trial, and argued that there were no differences in performance improvements between a correct or learning demonstration, where subjects learnt a squatting movement pattern, in either immediate learning or following a 48 hour retention period. However, although not significant, a number of trends appear in McCullagh and Meyer's[12] data. Firstly, over the initial 5 practice trials, the correct demonstration was more effective, however, the second trend present is that by the final 48 hour retention trial, the learning demonstration group appear to have retained the squatting skill more effectively. A major issue with the results of McCullagh and Meyer[12] is that the control group used observed the same demonstration as the learning group, but did not receive feedback regarding the demonstration. This may actually highlight that the

important coaching factor is the cues given regarding a demonstration, rather than the demonstration itself. Furthermore, whilst it appears attractive that a squatting pattern was researched, the task was actually to perform 14 squats in 30 seconds against a load of 30 lbs, which does not replicate what would be utilised in most strength and conditioning settings, nor is it mentioned the depth of squat that was required, which is an important issue of coaching philosophy within strength and conditioning. In further research by McCullagh and Caird,[11] it was identified that a learning demonstration was significantly more effective than a correct demonstration, in learning a task requiring barriers to be knocked down in a given time and order, both during the initial skill acquisition test and in an immediate and 24 hour retention test. This research provides clear support for the use of a learning model for both immediate skill learning, but also, importantly, the ability to retain skills. However, it is again important to note that both the learning and correct demonstration groups also received demonstration feedback, as well as initial instructions on how to complete the task, which may limit the power we can place on the effect of the differing demonstration methods. Finally, Hirose *et al*.[4] also identified that a learning model was the most effective demonstration form when learning a task requiring patterns to be made on a computer screen with hand controlled rails. Whilst the learning demonstration was the most effective, this was only significant compared to the control group, and only approached significance when compared to the correct demonstration group. Despite the novel task and the lack of significant difference between the learning and correct demonstration groups, this research did show a trend over a 24 hour and one week retention period for a learning demonstration to offer greater retention benefits than a correct demonstration.

Summary of the Research

The literature available at present regarding who should provide demonstrations may appear to favour the use of a learning model, particularly when considering the aim of ensuring that skills are retained over time. The effectiveness of a learning demonstration would appear to be due to the learners being actively involved in a problem solving learning process, which is likely to require greater levels of attention. It may also be possible that a learner's motivation may be enhanced through the use of a peer demonstration, due to the learner striving to outperform the peer demonstrator and this may also go some way to enhancing skill retention levels.

Practical Implications

For most strength and conditioning coaches two major coaching areas of work are within the weights room and the speed and agility setting. These are two very different environments, with skills within the weights room being of a closed nature and those in the speed and agility setting needing to be transferable to the open environment of sports. In establishing the need for speed and agility skills to transfer directly to sports performance, and the associated open settings, our athletes may gain some benefits through the use of a learning and possibly peer led demonstration, as opposed to a purely coach led coaching process. The major factor allowing us to utilise a peer led learning model in a speed and agility setting is the much reduced safety fears when compared to the weights room. For most S&C coaches, a feature of their philosophy will be to do no harm to their athletes, which provides a challenge if they are aiming to utilise learning and peer led demonstrations. It is likely that a learning demonstration of skills such as olympic lifts used in the weights room, may not necessarily provide a safe technical model. When combining concerns over safety and the fact that exercises performed in the weights room, for the majority of athletes are only a training modality and not a competitive skill, it may be more advisable for a more correct demonstration to be utilised, which is coach led. This is particularly so if we require our athletes to obtain a skill quickly, as it is likely that a learning demonstrations will take longer to achieve the skill acquisition outcomes sought after. A number of further issues concerning who should provide demonstrations, although not limited to this decision process, should also be considered, including, what is the current stage of learning of the athletes in question? This will influence what is deemed a learning and correct demonstration. Similarly, an understanding of the learning style favoured by an athlete is important, with more visual learners clearly preferring the use of a demonstration and finally the type of skill which is being learnt, in terms of whether it is continuous, discrete or serial.[2]

Conclusion

It has been identified that a learning and peer led demonstration may offer a better retained form of observational learning compared to a correct coach led demonstration, possibly through enhanced levels of attention and motivation. However, it is also important to highlight that the role of practice is ultimately still crucial, and that, whilst a learning model could potentially be more enduring, as S&C coaches we are often limited by time available prior to competition, which may require the use of more correct models to speed the immediate learning process. It is also worth noting that demonstrations are only one available coaching tool, and that, in reality, they are used in combination with other tools available to coaches, such as feedback. Furthermore, the decision of who provides your demonstrations should take account of safety concerns and whether these must be constrained for, or whether the greater concern is how directly the skill transfers to the sporting setting. Ultimately, it is likely that the issue of safety versus skill transfer, combined with coaching philosophy and the characteristics of the given athletes, will lead to the selection of either a correct or a learning demonstration. However, research does identify that a peer led learning demonstration may offer some benefits to our athletes and does not appear to do any harm, therefore it may offer an additional coaching tool to us as S&C coaches.

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