CHAPTER 7

OBSERVATION AS AN INSTRUCTIONAL METHOD

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INTRODUCTION

Learning through watching others appears to be a pervasive method of skill acquisition. The fact that observing someone else perform a skill can positively impact on one's own skill is not debated. What is of interest and debate, however, concerns how learning is achieved through watching others (or oneself), what information is being imparted, and how this depends on the complexity of the action, the skill level, and the goals of the watcher. This information filters down to techniques for imparting knowledge through demonstrations, such as understanding when demonstrations should be given and what they should contain. This, perhaps, becomes even more relevant when we consider that practitioners have more technology available to them than ever before and it is no longer a cumbersome process to provide video models to assist with motor skill acquisition and performance. The mere observation of a model providing a demonstration, however, does not necessarily lead to benefits. Rather, it is important for practitioners to be informed of potential factors that aid or reduce its effectiveness. Our goal in this chapter is to provide an overview of these factors in relation to current research and theory.

DEFINITIONS AND MEASUREMENT

Let us start with some definitions of observational learning. In the literature you will see the terms "observational learning," "observational practice," "imitation," "emulation" and "modeling." In all cases an observer watches a dynamic demonstration or static image of a "model" performing a skill in order to later re-enact that skill. The model might be a skilled individual, a learner, oneself, a computerized biomechanical display, or an edited video. If the goal is to copy the exact action, technique, or expression, then this might be referred to as "imitation." Probably more common is “emulation,” whereby an individual attempts to achieve the same goal(s) as the model. These are both encompassed by the term “modeling,” as frequently an observer is trying to use movement-related information to achieve an end goal (e.g., throw a ball a particular distance by adopting the technique of a more skilled individual). “Observational learning” and “observational practice” have been differentiated by the presence or absence of interspersed physical practice respectively. In applied settings it would be rare to watch multiple demonstrations without the chance to physically practice. However, the study of pure observational practice allows researchers to make direct inferences about information that is imparted through watching (uncontaminated by knowledge gained through physically performing). Given the more frequent use of demonstrations interspersed with practice, we will use the term “observational learning” in this chapter to more generally refer to the process of learning through observation.

As with any measure of learning, it is important to consider how demonstrations impact rate of skill acquisition and short-term performance (i.e., how quickly someone gets better) and how well a skill is retained (i.e., how well a skill is remembered across time), as well as what has been learned in terms of generalization to new contexts or similar skills (i.e., transfer). Typically, observational learning benefits are assessed by measurements of accuracy (is a person reducing their error?) or measurements of form (is a person performing more like a model?). In rare cases, visual gaze has been studied to enable inferences about what information is gleaned from a model and how this changes with practice, as well as measures of brain activation to isolate similarities or differences from physical practice or other more covert measures of practice such as imagery – using techniques such as functional magnetic resonance imaging (fMRI), electroencephalography (EEG), and magnetoencephalography (MEG). Although sophisticated equipment is needed to gain accurate information about these features, such as eye trackers, brain-imaging equipment, and motion analysis systems, simple and cost-effective solutions are available in the field to record and analyze movement – such as Dartfish video-editing and analysis (www.dartfish.com) – as well as gain information about where people are looking (e.g., head-mounted web cameras).

How do demonstrations work?

It is likely that a considerable amount of learning from demonstration occurs through the imparting of a strategy or a specific technique that is highly related to task success. For example, to throw a dart accurately, one strategy might be to minimize movements of the shoulder and the elbow. It has been argued that learning through observation is more than just picking up on strategies and this has been supported by research showing that verbal or written instructions are not always as effective as demonstrations. However, it is possible that demonstrations convey multiple strategies that cannot easily be conveyed through instructions or that demonstrations impart more subtle knowledge than can be imparted explicitly (such as realizing the time of release of an object).

It is thought that demonstrations enable a representation or image of an action that can be used to guide later attempts (much like a perceptual blueprint). There is also evidence that it is difficult to image something that cannot be physically performed, such that this representational mechanism might be limited to skills that are relatively simple or that merely need refining or sequencing (such as perfecting a kick or learning to sequence some dance moves). Indeed, we know that experience modifies the patterns of brain activation seen when observing moves that can or cannot already be performed. There has been evidence to suggest that demonstrations can function to improve learning in a more implicit manner, potentially through a "simulation" process whereby motor-related areas of the brain and possibly muscles are activated (at a reduced level in comparison with actual execution) during observation. Although there is considerable evidence to show that there are cortical brain similarities between physically performing and observing for well-practiced actions, this more implicit type of motor simulation is less likely for novel actions and in the early stages of learning. For the practitioner, this means that the same demonstrations will potentially work differently, depending on the existing skills of the learner. Although there is value in providing demonstrations throughout different stages of skill acquisition, early in the practice of a relatively novel skill, demonstrations might provide more of a strategic value than later when the observer might be able to activate their motor system to covertly practice or simulate what they are seeing. Further research is needed to elucidate what this simulation might involve and when and how it is achieved.

What are demonstrations used for?

In addition to skill-based functions of demonstrations, that is, learning and the acquisition of skill-related information (whether these are perceptual blueprints, strategies, or more implicit information), demonstrations are also believed to provide an important affective role. Albert Bandura, who could easily be considered one of the most influential theorists of observational learning, identified both cognitive and affective processes that could potentially aid performance and learning through observation. A person's perceptions of competency or success at a task (i.e., self-efficacy) were shown to be promoted through vicarious experiences of a given task; that is, observation led to higher levels of self-efficacy. Self-efficacy perceptions are important because they promote persistence and effort, ultimately resulting in improved performance. There is also evidence that watching a model can lead to reductions in fear and anxiety, which might be associated with high task difficulty and chance of injury (e.g., a somersault on a trampoline or a springboard dive).

The functions of demonstrations have also been explored through an assessment tool called the "Functions of Observational Learning Questionnaire." Through the sampling of a large number of athletes from a variety of sports, demonstrations were reported to broadly serve three functions, with varying frequencies. Not surprisingly, "to learn and improve skill execution (skill function)" was the most common. Less frequently, athletes reported that they used demonstrations "to learn and improve strategies and game plans (strategy function)." Least often, observation was reported to play a "performance function," aiding mental and physiological arousal. In terms of research, most attention has been directed to the skill-function of observation.

How do we use observation effectively?

There are many factors to consider in answering questions about how to use demonstrations as an effective practice or competitive enhancement tool. These factors have been noted by a number of different authors over the past few decades but most recently these factors have been integrated into an applied model for the use of observation (see Figure 7.1). The characteristics of the observer and the task should be given early attention. For observers, factors such as their age and stage of learning (novice or advanced) will influence the success of the observation experience. Task characteristics can include factors such as skill complexity, action goals, and whether the skill to be learned is discrete, serial, or continuous. Discrete skills are those that have a defined beginning and end, such as a cartwheel. When discrete skills are combined together they form serial skills (e.g., cartwheel to back walkover), whereas continuous skills are those that have an arbitrary beginning and end (e.g., running or swimming). Observation effectiveness is dependent on these task characteristics, so they need consideration before embarking on observational practice interventions. The second level of the applied model is based on the reasons why the learner is using observation (i.e., function) and the situational context (e.g., training versus competition). These factors listed above will impact on (a) the type of model to use, (b) the content of the demonstration, and (c) when they should be administered and the structure of the training session (before, after, during, intermixed), as well as (d) how they should be provided (e.g., frequency, speed, control of viewing). We review some of the literature on each of these four modeling characteristics (i.e., who, what, when, and how), but recognize they are limited in scope and encourage readers to expand on this content by perusing some of the selected works recommended at the end of this chapter.

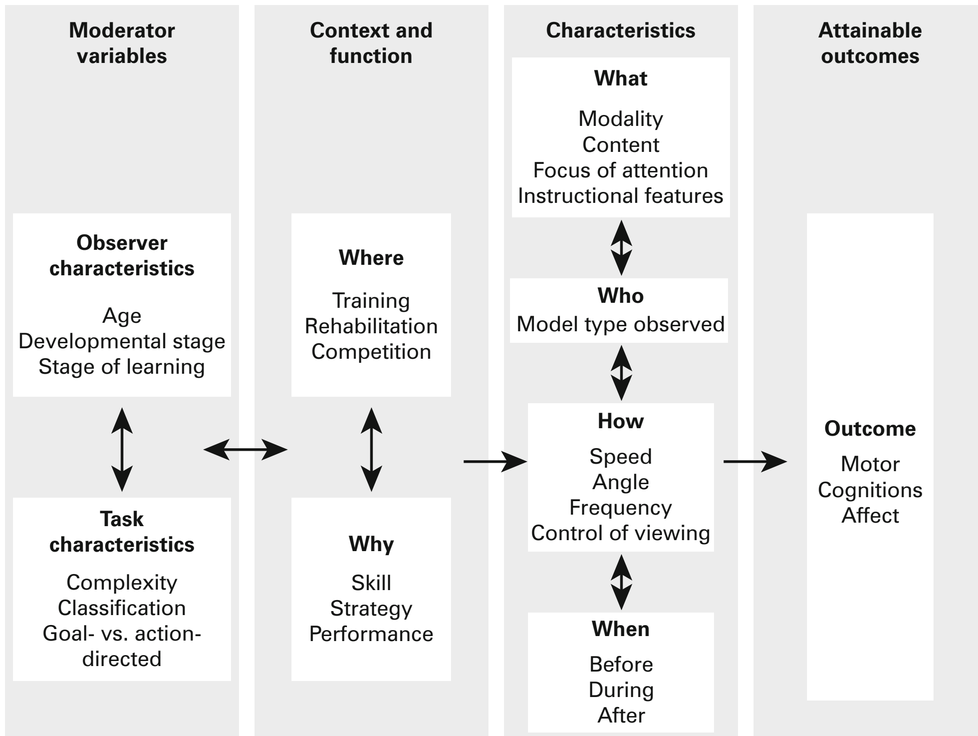

Figure 7.1 The applied model for the use of observation. (Reprinted with permission from Ste-Marie *et al.*, 2012.)

THEORY INTO PRACTICE

Whom should I watch?

There are a variety of model types to choose from, with a basic distinction being the observation of others as opposed to that of the self. When observing others, one can observe a skilled model that is showing "ideal" execution, or an unskilled model showing errors in execution, or even learning models that progress from "incorrect" to "correct" execution. Although a correct model might be referred to as a "mastery" model, some researchers have added verbal statements during the observational learning period to highlight this mastery component and to tap into the skill-based function of observational learning as well as the affective component. For example, a skilled model that also verbalizes self-efficacious statements, such as "I know I can do this skill" and low task difficulty (e.g., "this is an easy task for me") is referred to as a "mastery model." In contrast, a "coping" model is one that progresses from low to high(er) skill, as with learning models, but might also be accompanied by low to high self-efficacy statements and high to low statements concerning task difficulty perceptions.

Viewing others

Skilled models have frequently been shown to provide a skill acquisition benefit and this benefit has been linked to the formation of a strong mental representation of what to do (i.e., a goal template) as well as increased attention from an observer to a model that they perceive to be highly skilled and competent. Researchers initially argued that only a skilled model could be effective for teaching because of the importance of or need for a correct mental representation of the skill. It is now recognized that an unskilled or learning model can assist observers with skill acquisition as long as the performance-dependent feedback provided to the model is also available to the observer. For example, it is not enough to see the action required to perform a throw or kick; rather the observer must also be able to hear any corrections to the movement provided by the coach and see or be told where the ball landed. Augmented feedback, coupled with the observed demonstration, engages the learner in problem-solving processes related to the motor solution and thus also facilitates learning as long as the learner is clear about what he or she is trying to achieve. Moreover, a model that is perceived to be more similar to the observer has sometimes been shown to be more effective for learning, perhaps as a result of greater attention and ease of simulating or copying than that of a highly skilled model. Thus, when a skilled model is not immediately available, practitioners can use others in the group to model the skill, but they must be sure to provide the necessary corrections to skill performance for all to hear.

When comparing mastery and coping models, it is noted that the type of model can influence what is learned through observation. Perhaps not surprisingly, mastery models have been shown to be more effective for enhancing skill execution, but coping models have had more of an effect on observers' perceptions of self-efficacy. Accordingly, practitioners who want to first focus on an athlete's self-perceptions of confidence to do a task could begin with a coping model and then transition into a mastery model as they begin to target more physical aspects of the performance.

Watching oneself

Observation of the self is an alternative way of modeling desired behavior and some research has shown that the self can be a better model than others. There are two basic forms of self-as-a-model interventions. The first is standard video replay, termed self-observation, wherein the learners observe their previous attempt(s) of the skill. In effect, this type of demonstration also functions as feedback as the observer gains access to the visual consequences of their actions, often allowing them to see features of the action which were hidden from them during performance. The second form is self-modeling and involves video editing before viewing.

Self-observation research has yielded somewhat equivocal findings that make it difficult to assess its usefulness for skill acquisition. The varied findings highlight that there are important factors related to the effectiveness of self-observation. One factor concerns the observer's stage of learning. Novice learners need to be guided in terms of the relevant features in the display to which attention should be directed, whereas advanced learners can use self-observation without such direction. Researchers have also shown that novice learners who see their own performances alongside that of an expert (or a correct model), either in a split-screen format or immediately preceding a demonstration, obtain additional benefits from self-observation as compared with only viewing themselves or only viewing a demonstration. Thus, comparative information can enrich the learning experience provided by self-observation. Finally, equivocal findings in research may be related to the lack of information surrounding the frequency of viewings, when videos were used, who controlled when a video was viewed, what instructions accompanied a video, and other such variables that can be manipulated. More research on these issues is needed to further guide practitioners in the use of self-observation. We are unaware of any negative effects associated with self-observation for motor learning and, especially for actions that are difficult to see (i.e., you cannot see what your arm is doing when it goes behind your head during a cricket bowl or tennis serve), making the "unobservable observable" would appear to be a sound principle.

For self-modeling, two techniques have been used to edit the video. The positive self-review technique involves the elimination of poor performances, such that the observer only sees their best performance attempts. The feedforward technique is different in that it entails editing the video to show the individual executing at a performance level that has not yet been attained or in a context in which that task has yet to be executed. In Figure 7.2 we have shown six video stills showing different phases of a gymnastic stunt (i.e., back handspring) assembled from multiple attempts at this action. With reference to skill acquisition, again the research has yielded relatively mixed results. Self-modeling has been shown to enhance certain skills, such as in trampolining and swimming. In studies of gymnastics, figure skating, and volleyball skills, however, athletes who used self-modeling techniques in addition to physical practice were no better than those who used physical practice alone. These discrepant findings may be related to the skill level of the athletes or to the type of self-modeling technique used (positive self-review or feedforward). For the two skills where benefits were noted, the feedforward technique was adopted

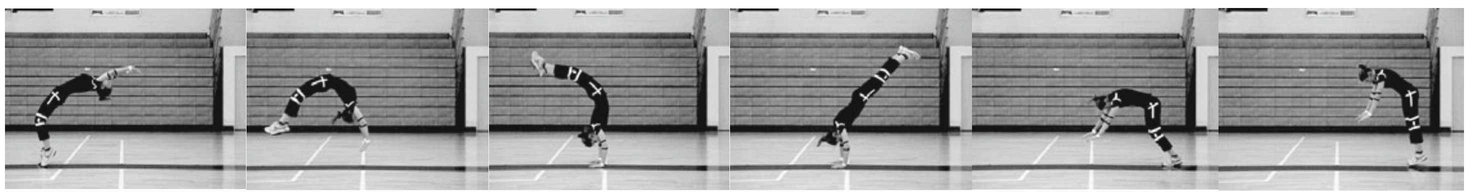

Figure 7.2 An example of a "feedforward" video shown for illustration as six consecutive still frames. In this example the gymnast is performing a handspring which has been assembled from different phases of her best attempts at performing this skill.

with novice learners, whereas, in the studies that failed to show benefits, positive self-review was used with intermediate skilled athletes. Therefore, although further research is needed to isolate the important variable behind self-modeling benefits and potential learner–technique interactions, watching oneself perform a "future" behavior seems to have more power to effect change, particularly during early learning, than positive review of current performance. What is worth considering, however, is that a fair amount of labor and time is needed to construct self-modeling videos than using self-observation, so we question its utility in all skill acquisition settings.

There is also some evidence that self-modeling videos provide an important performance enhancement role. Research with gymnasts showed that higher competitive scores were obtained when the gymnasts watched a feedforward self-modeling video than when they did not watch one. Despite the time needed to create the video, the advantage for the gymnasts was three-tenths of a point: an increase in score that can make the difference between fourth place and first place on the podium. Interviews with the gymnasts revealed the important role of the video for increasing self-efficacy and placing them in an optimal arousal state prior to competition (performance function), as well as inciting other strategic functions (e.g., using imagery).

In summary, when considering who should be observed, the practitioner needs to consider that skilled, unskilled, mastery, and coping models all have a role to play depending on the skill level of the learner and the goal of the observation experience. Self-as-a-model techniques also have merit, with self-observation augmenting the skill-learning experience when consideration is given to the observer's stage of learning and guidance is provided as needed. Feedforward self-modeling appears to be more effective than positive self-review and self-observation for skill learning. Feedforward self-modeling may be of most benefit in the competitive sport performance environment and in the early stages of skill learning.

What should a demonstration contain?

The observer's existing skills (or what might be referred to as "functional task difficulty") and the difficulty of the to-be-learned skill (what has been referred to as "nominal task difficulty") are important considerations when making decisions about what information a demonstration should contain as well as where attention should be directed. Rather than try to comprehensively address all the various information manipulations and measurements of critical information, we highlight below a few cautionary notes about the content of demonstrations. First, a learning context that includes demonstrations conveys multiple goals and thus it is important for the observer and the practitioner to be aware of their main or primary goal throughout practice. It is important to consider whether the primary goal is to copy the action or to achieve an outcome. There is evidence to show that technique is sacrificed at the expense of goal attainment if insufficient emphasis is put on movement form. Children are especially susceptible to this prioritizing of outcome goals at the expense of movement goals. Although outcome attainment might be more rewarding for an individual and allows for creative and self-determined solutions for outcome success, in some skills this sacrifice of movement quality for outcome success could have later repercussions. For example, an inefficient cricket bowling or tennis service action might lead to fatigue or injury during competition. Certain techniques are inherently more variable than others (perhaps because of the number of joints involved). Under conditions which are likely to promote further variability, such as increased competitive pressure, the original more variable technique is likely to be more negatively affected. Therefore, if modeling a desired technique is viewed to be a primary goal of the observational learning process, it may be necessary for the practitioner to de-emphasize outcome attainment by rewarding form-related goals at the expense of outcome attainment.

Related to this issue above and the need to prioritize actions or outcomes during observational learning, there is some debate about whether individuals should be guided to acquire an “ideal” technique and hence focus on form-related goals. For researchers who advocate a constraints-based method of teaching, it is believed that the movement itself or the technique should be viewed as one potential solution to an outcome goal and not a prescription for individuals to copy. If an individual is shown only a technique-oriented demonstration that is not clearly related to the outcome, or if form rather than outcome success is emphasized as the goal, arguably the learner might copy a movement solution that is not optimal for their stage of learning, body size, or strength. However, there is clearly some benefit to be gained from guiding people to find efficient and effective movements. Therefore, the practitioner or learner must consider the relationship between actions and outcomes and find a balance between prescribing what to do and allowing the learner to sculpt a solution that allows them to achieve the task outcome quickly and appropriately based on their existing skills and needs. Awareness of these potentially conflicting goals and needs is important for successful teaching.

Data from visual gaze tracking and occlusion studies (where key areas at specific time points are degraded or removed during observation) suggest that the critical information from a model performing a goal-oriented action pertains to the action end point. This might be the trajectory of an object to be thrown, the foot that is kicking a ball, or the bat or arm that is swinging during a batting or golfing action. If a kicking action is being taught, an observer will typically focus their attention on the foot of the model, although there is suggestive evidence that the focus becomes less distal (away from the body’s midline) and more proximal (towards the body’s midline) as both physical and observational practice proceeds. Interestingly, people do not even need to see the actions of the model to gain from observational practice. Trajectories of objects (such as a ball or Frisbee® disc) convey information about the throw or kick such that the movement solution can be discovered as a result of trying to "match" an outcome effect. There is considerable evidence to support such an "externally" oriented focus of attention during performance and learning in order to attain maximal skill outcomes. What practitioners must promote, however, is change in performance when observation is serving a skill acquisition function. That is, if one type of demonstration is not leading to a change in the learner's form (and that is the desired goal of the instruction), then a new type of model might be needed and/or a change in instructions and feedback.

For some individuals, change can be brought about by focusing externally and attempting to emulate what they are seeing, whereas others seem to need more prescription (i.e., this is how you do something) in order to bring about a change in an ineffective or immature movement pattern or technique. Cueing has been shown to be an effective technique to help learners pay attention to information within a demonstration that is believed to be critical for success (depending on the observer's needs and current skill level and technique). Although a body-focused cueing technique might be helpful for practice and changing movement form, it is generally agreed that, for optimal performance in competition, attention to the external action effects is more likely to result in skill efficacy and efficiency than attention to body-related components (see Chapter 10). It is worth noting that both a body focus and an outcome focus can be independently encouraged through video, depending on how the video is edited and the goals of the demonstration.

When do I show (and tell)?

Much like physical practice, retention advantages are gained from scheduling of demonstrations in such a way that the observer is maximally engaged in the task. This means actively trying to detect errors, looking and thinking about ways errors are corrected, and watching with the intention to learn and later re-enact (see Chapter 8). For example, if the intention is to learn a number of different skills, such as a forehand Frisbee® disc throw, a backhand throw, and a left-hand throw, then it is more beneficial to show these skills in a mixed or random schedule than it is to repeat the same skill multiple times before demonstrating the next. It also helps to let people choose when to see a demonstration during observational learning. Demonstrations are most effective if they are provided early in practice, rather than just interspersed during practice or only provided later in practice. However, allowing people to discover for themselves what to do early in practice before being shown what to do can have later benefits for skill retention. These so-called “retroactive demonstrations” are believed to aid cognitive processes associated with memory and self-evaluation of actions.

There is currently some debate about whether demonstrations can take the place of physical practice when interspersed in a learning paradigm with physical practice. This is of course important in a practical context where physical practice time might be limited and hence observational practice may be a valuable low-impact training opportunity. For example, if 200 trials of practice are given, does it matter whether 50 percent of those trials are watched rather than physically performed? In one study involving dyad (two-person) learning of how to make wide and fast movements on a ski simulator, alternating physical practice between the pair (i.e., 50 percent observation, 50 percent practice) was as beneficial as 100 percent physical practice throughout. Similar results were found in a study that required people to aim towards targets in a novel “virtual” type of environment. Mixed practice, where 75 percent of the practice was by observation, was as good as physical practice in terms of accuracy on a posttest. Interestingly, in measures of recalibration of the motor system to determine whether the relationship between motor commands and a person’s intended effects had changed, the mixed practice group showed more recalibration than the physical practice group. Just observing, although beneficial with respect to first-time performance in the novel environment, did not lead to the same type of learning as physical or mixed practice (i.e., no recalibration). There are a number of studies which lead us to suspect that observational practice promotes a different, more strategic type of learning than physical practice but that interspersing physical practice with observational practice might alleviate these differences and potentially aid processes related to physically practicing. However, this is still quite speculative and further research is needed.

Finally, there is some evidence that watching demonstrations leads to gradually improved perceptions of ability, which might suggest an important affective component associated with observational practice even though it might not translate into immediate improvements in motor outcomes. Allowing people to view demonstrations when their abilities are low might foster a sense of competency which at the very least should aid motivation to continue to practice.

How much should I watch?

In terms of the amount of demonstrations to provide, as noted above, research has shown that the relative proportion of observation can be as much as 75 percent observation to 25 percent physical practice, with the same gains shown as 100 percent physical practice. Other researchers have reported that, when given the choice under time-constrained conditions, the preferred frequency of demonstrations to physical practice is about 10–20 percent of the overall amount of practice. People prefer "doing" more than just watching and it makes sense that this would be the case as physically performing provides the individual with self-generated feedback and a sense of their own action capabilities. However, it does appear that the more demonstrations watched during practice, the more likely it is that a desired movement form will also be adopted in addition to successful outcome attainment. Therefore, although giving athletes some control over how much they watch has some benefits, potentially having some base line levels associated with observation frequency might be useful if technique goals are important.

A variety of factors are likely to come into the determination of the relative percentage of observation to physical practice within a practice session. For example, some activities generate greater muscle fatigue, not allowing for extensive repetitions within a practice setting. Therefore, a greater amount of observation to physical practice may be required than in activities in which physical practice of the skills can be more frequent with little physical fatigue. Another factor to consider is whether the skill acquisition setting might involve taking turns. In this case, practitioners could optimize this practice scenario by encouraging those waiting to attend to their team-mates' performances and to listen to their corrective feedback. Given factors such as these, there are no specific rules concerning the optimal amount of observation to integrate into a practice but practitioners are encouraged to mindfully incorporate observation in what appears to be "dead" time in the practice.

CONCLUDING REMARKS

There are a variety of factors that practitioners can consider for optimally integrating observation into physical practice, such that the practice structure is designed to maximize the coaching outcomes. Based on the above review we have chosen to compile a list of our top 12 considerations for the effective use of observation for performance and learning. These considerations are detailed in Box 7.1.

Box 7.1 Top 12 list of considerations and guidelines for the effective use of observation

1 Observation should be combined with physical practice for maximum benefit.

2 Demonstrations should be interspersed with practice in a faded schedule (more at first, then gradually reduced) such that they are not relied upon and the learner figures out for themself what they need to do to achieve success.

Box 7.1 Continued

3 The type of model should be dictated by the observation objective. If the goal is for the learner to feel more self-efficacious about their own capabilities to learn a new skill, a coping/learning model may work best. If the goal is for detection of critical movement information, a skilled (or mastery) model would be more effective.

4 Watching oneself perform a “future” behavior (through video editing) has more power to effect change, particularly during early learning, than positive review of current “best” performance.

5 Verbal cues can help guide observation. This is particularly useful for younger children and new learners.

6 Demonstrations work as performance feedback as well as prescriptions about what to do. Coaches should be aware that attempting a skill before being shown what to do can aid skill retention.

7 Demonstrations need to work to encourage change if they are serving a skill acquisition function. Differential emphasis on the action, the action end point, or the outcome goals should be considered to bring about change.

8 Observation serves a number of functions not only to improve skill learning and performance, but also for learning about strategies and modifying performance state variables (such as emotion, confidence, competitiveness).

9 Athletes should be encouraged to watch each other and to listen to the coaches’ feedback during their own recovery or wait times to get the most out of a practice session. Taking turns in physically performing an action with a fellow athlete will afford opportunities for both physical and observational practice. This “mixed” method of interspersing observation and physical practice appears to be optimal for learning.

10 Allowing athletes to choose when they want to have a demonstration or see themselves on video can enhance the observation experience (although scheduling minimum amounts might be a good idea if technique changes are desired).

11 Demonstration effectiveness is enhanced through comparative information, such as self-videos.

12 Technique-focused demonstrations are best for practice and changing movement form. For optimal performance in competition, demonstrations that promote attention to the external action effects/outcomes are more likely to result in skill efficacy and efficiency (i.e., successful outcomes).

COACH'S CORNER

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Former Canadian Olympic beach volleyball coach

My first reaction on turning to the last page was "wow!" Doing less physical training and relying more on observation could prevent considerable wear and tear and prolong the life of an athlete by quite a few years. Why, then, are we not doing more of this kind of training? What challenges do specialists and experts encounter when attempting to apply this approach across the board?

I am fortunate to have worked with Olympic athletes as well as elementary school kids and everything in between. At the university, I have the luxury of instructing beginners and thus utilizing and testing various approaches to teaching basic volleyball skills.

I cannot dispute the findings of many studies supporting the validity of learning and training by observation. In fact, we have used these approaches with our varsity team throughout the years. However, I can list some of the additional challenges I have faced as I attempted to introduce this method, and offer some suggestions on how to make it better:

1. (a) What the brain captures and what it communicates to the muscles as actions to be emulated does not necessarily determine how the body will perform. The best evidence can be gathered by asking observers what they are doing; they may respond with different explanations for their performance. I will expand on this later.
2. (b) Elite athletes tend to be "doers." In fact, the culture of sport emphasizes and praises hard work as something essential for success in sport. There are two key points here: one relates to the mentality of elite athletes and coaches, and the second to the culture of sport.

Discussion

I will expand here on the point raised above – point (a) – about the ways in which watching translates into performance by sharing my experiences as a teacher of beginner, intermediate, and advanced athletes:

1. A discussion of the relationship between observation and performance should take into account the fact that the brain processes visual information on different levels. An athlete will not be conscious of everything he or she has taken in. We see proof of this by observing the performance of athletes who have watched a demonstration of movements and then attempt to copy them; often we are surprised by the fact that they do something markedly different. Their expressions of amazement after seeing themselves on video suggest that frequently there is a disconnect between what the eyes/brain computes and the physical performance. One of the methods I use to optimize the benefits of an observational exercise is to ask athletes to

execute the “wrong” action. I call this “Reverse Mechanics.” Interestingly, once these athletes are made conscious of the wrong way to perform a movement, either they have difficulty doing it or they look at you strangely because they have been told numerous times by other coaches not to do it that way.

2 When athletes are asked to explain movements or demonstrate them for others, quite often their explanations do not correspond with the demonstrations.

3 It is always important to include a demonstration of the “wrong” way to provide observers with an image of actions to be avoided. Usually, I “clown around” exaggerating the typical mistakes so that students can see the difference between the correct movements and the incorrect ones. I have found this approach to be particularly effective with beginners.

4 Many theorists are committed to the “just doing it” approach. They believe in learning by playing with few additional cues. In other words, at the initial stages, coaching should be minimal.

5 Showing an athlete what an action “feels” like is another method I favor. This involves having athletes perform the action while limiting some sensory options (closing their eyes) so they can focus fully on how it feels to execute a particular movement. Some sports make frequent use of this approach (e.g., gymnastics and diving), but very seldom do we use it for instructing team sports.

In relation to my second key observation – point (b) – one of the other major challenges we face – and we do not see this addressed in this chapter – is how to arrive at a better understanding of the relationship between the mental state of athletes (particularly elite athletes) and the culture of sport:

1 Individuals become elite athletes because they possess traits that differentiate them from others. The ability to endure and enjoy hard physical work no doubt ranks high among those traits. Consequently, one can assume that elite athletes are keen on being active and that the opportunity to observe is not appealing unless it is accompanied by a systematic approach and compelling arguments.

2 The culture of sport has emphasized hard work to the exclusion of almost everything else. The idea of “working smart” has been introduced but, like all new ideas, it is gaining acceptance very slowly. If learning by observing is to become a key piece of the instruction and training of athletes, we must change the culture by convincing our coaches and athletes that there is now plenty of evidence that supports this approach and that it is both a better training method and better for the athletes.

Conclusion

This is a welcome contribution by Nicola J. Hodges and Diane M. Ste-Marie. They have gathered compelling evidence to steer the teaching and coaching of sports in a fruitful direction. If the challenges outlined in this commentary are addressed, the success of this approach is very plausible.

ACKNOWLEDGMENT

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