



THE COACH AS A DICTIONARY

What roles does augmented feedback play in motor learning?

When was the last time you looked up a word in a dictionary? What was the word you looked up? Why did you look it up? The last word I looked up was *exasperate*. I wanted to use it in a sentence that I was writing and needed to verify the exact meaning of the word and to make sure that my spelling was correct. As it turned out, I was correct about the meaning, but I had the spelling wrong. I don't tend to use a dictionary often, but it is always useful when I do. The dictionary provides me with gold standard information when the reliability of my own knowledge is in doubt.

A coach, instructor, or teacher who facilitates the motor learning process is very much like a dictionary. This person provides the learner with reliable information, usually about something the learner is doing incorrectly and often about something the learner is unaware that she is doing incorrectly.

Often, our awareness of the accuracy of our intended actions arises from sensory mechanisms within the body. Our eyes provide visual information; our ears provide auditory information; our skin provides tactile information; and sensory mechanisms in the muscles and joints provide information about movement, called proprioceptive (or sometimes kinesthetic) information. Researchers call this information *inherent feedback* because it arises from within the person and is “fed back” to the brain to update the current status of either an ongoing movement or one that has just been completed (see “The Curling Draw” in chapter 7 for more on the closed-loop process of using feedback to regulate movement).

People who facilitate the learning process represent another source of information about the status of our actions. For example, they can describe something verbally, such as informing a diver that her tuck was opening too soon during the spin. They can also provide us with visual information, such as a video of the just-completed dive. Researchers use the term *augmented feedback* to describe this type of input because the information does not arise inherently from our own senses; rather, an external source has fed back additional, augmented information that supplements the inherent information we have received from our senses.

For many years learning theory was dominated by the view that augmented feedback is an essential part of the skill acquisition process. Many believed that learning would be enhanced when inherent feedback was supplemented by augmented feedback (1) as often as possible, (2) as

soon as possible after the completion of the performance, (3) with as much information as possible, and (4) generally, in any other way that would help the learner make the greatest amount of improvement as fast as possible. Those theoretical views were supported by data from a large number of experiments.

However, a research team led by Richard Schmidt discovered a glitch in these findings. The researchers found that many of the positive effects of augmented feedback were restricted to the trials during which frequent and immediate augmented feedback was provided. If learners were subsequently left to perform the task only with their sources of inherent feedback, then performance suffered in many situations. Moreover, performance when the augmented feedback was removed suffered more so than it did in situations in which augmented feedback had been provided sparingly during practice, or delayed for a period of time during which the learners were asked to interpret their own inherent feedback. Of course, this is yet another example of the important distinction between performance and learning (see “Learning to Win From Losing” in chapter 8 and “But I Was Great on the Practice Range!” earlier in this chapter).

Researchers now agree that augmented feedback can be an excellent supplement to the learning environment if provided in ways that challenge learners to better understand their own sources of inherent feedback. But, when it is provided too often, or too soon, or in such a way that it is used as a substitute for understanding the status of inherent feedback, then the learner can be affected in a negative way. Some suggest that learners come to rely on augmented feedback as a crutch to support performance, and are unable to sustain that level of performance when the crutch is removed.

A good example of augmented feedback occurs in baseball. A pitcher can sometimes run into control problems during a game when he repeatedly makes an unintentional biomechanical error. The result is that he temporarily forgets how to throw the ball to a specific location. A good pitching coach can spot the problem and help the pitcher correct it. However, according to the rules of baseball, the coach can confer with the pitcher only once during play; a second conference results in the pitcher’s removal from the game. Therefore, it is to the pitcher’s advantage to learn how and why he makes errors that result in certain outcomes, but more important, to understand what his inherent feedback means, so he can detect and correct his mistakes without the coach’s augmented feedback.

When should augmented feedback be provided, and when should it be withheld? One way to think about optimizing the provision of augmented feedback is to think again in terms of the dictionary analogy discussed earlier, which provides gold standard feedback to the learner. We do not consult a dictionary for every word we write. Instead, we count on the reliability of our internal spell-checker to know when we have made an error.

Only when we question the reliability of our internal spell-checker should we consult a dictionary. In terms of learning motor skills, to be independent, we must learn to understand what our bodies tell us. To do that, we need to learn to interpret inherent feedback, and supplement it with augmented feedback only when necessary, as with the dictionary. The reliability of our own spell-checker is optimized when we no longer need a dictionary at all. Independence from reliance on augmented feedback is another marker of motor skill expertise.

SELF-DIRECTED LEARNING ACTIVITIES

1. Define *augmented feedback* in your own words.
2. Give an example of the difference between augmented feedback and inherent feedback in driving a car with a manual transmission.
3. A coach who tells a learner about a movement error is providing one specific type of augmented feedback (verbal). Using a video camera to provide feedback is another method. List three other qualitatively different ways of delivering augmented feedback.
4. Describe an experimental methodology that contrasts the benefits of various frequencies of augmented feedback.

NOTES

- I find that an online dictionary is very helpful and handy when writing www.merriam-webster.com
- Many of the research glitches that led to the mistaken conclusion that more augmented feedback was always better were reported in two important papers by Schmidt's research team:

Salmoni, A.W., Schmidt, R.A., & Walter, C.B. (1984). Knowledge of results and motor learning: A review and critical reappraisal. *Psychological Bulletin*, 95, 355-386.

Schmidt, R.A., & Bjork, R.A. (1992). New conceptualizations of practice: Common principles in three paradigms suggest new concepts for training. *Psychological Science*, 3, 207-217.

SUGGESTED READINGS

Schmidt, R.A., & Lee, T.D. (2011). Augmented feedback. In *Motor control and learning: A behavioral emphasis* (5th ed., pp. 393-428). Champaign, IL: Human Kinetics.