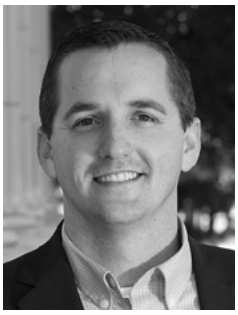
Lynn Maxfield, Associate Editor

Toward an Understanding of Attention and Awareness

Lynn Maxfield



Lynn Maxfield

If one is interested in studying and applying the foundations of cognitive science to the training of any field (in our case, singing), the terms *attention* and *awareness* must be understood. On its surface, this appears to be a straightforward and achievable task, and yet it is one that has proved to be anything but straightforward. Indeed, cognitive neuroscientists continue to investigate, theorize, and argue over how these two terms are defined, how they differ, and how they overlap. The following is a brief summary of the current understanding of *attention* and *awareness* as they are defined in the cognitive realm, with particular interest in their application to motor skill acquisition.

HISTORICAL DEFINITION OF ATTENTION

Now well over a century old, William James's classic definition of attention remains foundational.

> Everyone knows what attention is. Attention is the taking possession by the mind, in clear and vivid form, of one of what seem several simultaneously possible objects or trains of thought. Focalization, concentration, of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others.[1]

Beautifully written in clear, artful prose the likes of which we are unaccustomed to reading in current cognitive neuroscience, James's definition carries at least three fundamental elements:

1) "Attention is the taking possession by the mind of . . . several simultaneously possible objects . . . "—**Attention is selective**.

Through both voluntary and involuntary means, we must choose which of the hundreds of simultaneously occurring stimuli we will attend to at any instant. For example, you can voluntarily will yourself to direct your attention to practicing a new piece of music while ignoring the view of your classmates playing Frisbee outside the practice room window. That attention, however, can be involuntarily redirected when your phone chortles with a new text message inviting you to join those Frisbee-throwing loafers.

2) "Focalization, concentration, of consciousness are of its essence"—**Attention is mental (cognitive) effort**.

When we attend to complex tasks, we are expending mental effort to "focalize" or concentrate on that task. A number of early studies supported

Journal of Singing, November/December 2018
Volume 75, No. 2, pp. 197–200

this assertion by measuring increases in a number of physiological markers of effort and arousal during the performance of attention-demanding task.[2]

3) "It implies withdrawal from some things in order to deal effectively with others"—**Attention is limited**.

Consider the previous example of a singer practicing while friends played outside the window. The singer's attention was solely on the task of practicing until the incoming text message divided that attention, stealing at least some of it away. If attention were not a relatively finite capacity, then individuals could ostensibly train themselves to attend to any number of simultaneous tasks; they could train themselves to multitask. Lynn Helding dedicated an entire column to debunking this popular myth, appropriately dubbing it the "Multitasking Monster."[3]

ROLES OF ATTENTION

In a much more recent review of the cognitive neuroscience of attention, Maria Rosario Rueda and her colleagues built on James's definition and identified three overarching roles of attention.[4] In one sense, attention acts as a "selection mechanism," sorting through the thousands of stimuli bombarding our senses and choosing the relevant information. In another sense, attention serves to initiate voluntary activity, often inhibiting automatic or unconscious behaviors to do so. Finally, attention is also linked to the control of voluntary action, supervising goal directed behaviors and detecting error in order to make corrections.[5]

Two of these roles of attention can be further defined by whether they are initiated or controlled primarily by external stimuli (what is termed exogenous or stimulus driven control) or by internal direction or motivation (endogenous or goal oriented control).[6] For example, the selective function of a singer's attention may be exogenously initiated to direct attention to the audience (and thus away from their own performance) by the loud crinkling of a cellophane wrapped lozenge being fumbled by the patron in the front row. Alternatively, the same singer may exercise endogenous control of the selectivity of their attention by refocusing on the accompaniment to drown out the auditory distraction. In similar fashion, the alerting function of attention can be exogenously controlled (e.g., an unexpected key change by the church organist alerts singers to change their pitch as well) or endogenously controlled (e.g., a chorister listens intently to the organist's interlude and is alerted to the upcoming key change by the preceding harmonic structure and voice leading).

Attention's control of voluntary processes, however, is considered to be inherently endogenously initiated and defined by conscious error detection and inhibition of "incorrect" solutions to the task being attended to.[7] This process has also been referred to as executive attention, and it is essential to the comparison of real outcomes to the desired outcomes.[8] This comparison is at the heart of all learning (declarative *or* procedural).[9] If attention is this important to the act of learning, then fostering attention in students/learners, must be the most important goal of teaching.

CONSCIOUSNESS

Defining awareness necessitates a definition of consciousness. It is pleasingly symmetric at this point in the article to return to William James to describe the enormity if that task.

> Every hour we make theoretic judgments and emotional reactions, and exhibit practical tendencies, for which we can give no explicit logical justification, but which are good inferences from certain premises. We know more than we can say. Our conclusions run ahead of our power to analyze their grounds.[10]

In the *Oxford Handbook of Sport and Performance Psychology*, Rich Masters paints the chore similarly, albeit more bleakly.

> Even now, after 400 years or more of debate about the nature of human consciousness — if we date from the time of Descartes . . . — there is no unified theory of consciousness and, consequently, no single definition of what it is to be conscious: "consciousness is a word worn smooth by a million tongues," a "mongrel" concept that "leaves even the most sophisticated thinkers tongue-tied and confused."[11]

Still, daunting as it is, let us embark. In the 1970s, George Mandler began defining consciousness in terms of "events and operation within a limited capacity system, with the limitation referring to the number of functional units or chunks that can be kept in consciousness at any

one point in time."[12] By the 1980s and 1990s, consciousness was swept into the "brain as a computer" model of thinking and many psychologists began describing it in terms of an information processor whose goal was to "make sense of as much data as possible at the most functionally useful level."[13] Philosophers, however, began pushing back on this "oversimplification," noting that computers process information, but could hardly be argued to be conscious.[14] To help draw the distinction between the inanimate processor and the conscious being, they added subjective experience, or *qualia* (the ability to *experience* sensations that defy easy description) to their requirements for consciousness.[15] Information processing alone cannot accurately describe or define the sensation singing in front of an audience, that is something that must be experienced—and that experience should be accounted for in a definition of consciousness.

CONSCIOUS AND UNCONSCIOUS AWARENESS

With this decidedly abbreviated discussion of consciousness in hand, we can begin to conceptualize *awareness* as a state of consciousness. Traditional measures of awareness have always centered around the ability of the subject to report the presence or absence of certain stimuli—if they are able to report it accurately (or at least at rates better than chance), then they are aware of it. As such, conscious awareness could be, and has been, said to occur when "the contents of consciousness can be accessed for verbal report."[16] NATS member Karen Leigh-Post, however, has been pushing the traditional methods of measurement in her study of "cognitive bodily-kinesthetic awareness." Including the *qualia* mentioned in the previous section, she defines awareness as

> . . . a state of consciousness involving perception of sensory events without necessarily understanding them. Self or bodily awareness is characterized by an ability to integrate sensations from the environment and ourselves with our immediate goals to guide behavior.[17]

With her inclusion of perceiving without necessarily understanding, Leigh-Post's definition of awareness begins to open the door to awareness existing outside the confines of consciousness.

The concept of unconscious awareness argues that we may not be consciously able to recall anywhere near the full extent of stimuli of which we have been made unconsciously aware.[18] Indeed, several experiments have indicated that subjects were able to recall stimulus information that they were unable to consciously report, simply by being directed to a specific portion of the stimulus package. In other words, they had been unconsciously made aware of a larger portion of the stimulus package than they were able to consciously recall, and that unconscious awareness was "unlocked" by directing their attentional recall.

On the surface, this is great news—we can be aware of an enormous quantity of material without being consciously attentive to it. However, Masters points out one unintended consequence of unconscious awareness that we as teachers/coaches/guides may encounter.[19] When an individual is directed to avoid a certain behavior, two mental processes must be active. First, conscious awareness must suppress the unwanted behavior by actively focusing on desired behaviors. Unconscious awareness, then, continuously monitors for signs of the unwanted behavior. This system will function well until a distraction occurs that causes a lapse in the conscious awareness. At this point, the unconscious takes over and immediately reminds us of the "wrong" behavior. Thus, negative feedback/direction actually forces an unconscious awareness of the very thing we are trying to train away.

THE INTERSECTION OF AWARENESS AND ATTENTION

To this point, we have discussed attention and awareness in relative isolation. This is not without merit as cognitive neuroscience clearly recognizes that the two are separable.[20] Still, attention and awareness share at least some connection. Indeed, the previous discussion of unconscious awareness being recalled by selective attention indicates at least some level of interaction between the two. In one fascinating recent study of awareness and attention, psychologists at Princeton University have conceptualized and tested an "attention schema" that helps control attention.[21] You may recall that in order to control the body, the brain contains a body schema, an internal model of the body that provides a reference

against which incoming sensory inputs can be compared and evaluated. In the attention schema, awareness acts as the internal model of attention, allowing for attention to be more stable and accurate.

This concept, in my opinion, could have significant implications for how we train our singers to attend to the task of learning to sing. By encouraging awareness, we are building and refining the schema that they will use to control their attention—and attention is essential to learning.

NOTES

1. William James, *The Principles of Psychology*, ed., G. Miller (New York: Dover Publications, 1890/1950), 403–404.
2. Daniel Kahnen, *Attention and Effort* (Englewood Cliffs, NJ: Prentice Hall, 1973); Jackson Beatty and Brennis L. Wagoner, "Pupillometric signs of brain activation vary with level of cognitive processing," *Science* 199, no. 4334 (March 1978): 1216–1218.
3. Lynn Helding, "The Multitasking Monster," *Journal of Singing* 68, no. 4 (March/April 2012): 451–455.
4. Maria Rosario Rueda, Joan P. Pozuelos, and Lina M. Cómbita, "Cognitive Neuroscience of Attention: From Brain Mechanisms to individual Differences in Efficiency," *AIMS Neuroscience* 2, no. 4 (October 2015): 183–202.
5. Ibid., 183.
6. Ibid., 184.
7. Ibid., 185.
8. Michael J. Kane and Randall W. Engle, "The role of prefrontal cortex in working-memory capacity, executive attention, and general fluid intelligence: An individual-differences perspective," *Psychonomic Bulletin & Review* 9, no. 4 (December 2002): 637–671.
9. Lynn Helding, "Choosing Attention," *Journal of Singing* 68, no. 3 (January/February 2012): 324.
10. James, 168.
11. Rich Masters, "Conscious and Unconscious Awareness in Learning and Performance," in Shane Murphy, ed., *The Oxford Handbook of Sport and Performance Psychology* (New York: Oxford University Press, 2012), 131–153.
12. George Mandler, "Consciousness: Respectable, useful, and probably necessary," in R.L. Solo, ed., *Information Processing and Cognition: The Loyola Symposium* (Hillsdale, NJ: Lawrence Erlbaum, 1975), 229–254.
13. Anthony J. Marcel, "Conscious and Unconscious Perception: An Approach to the Relations Between Phenomenal Experience and Perceptual Processes," *Cognitive Psychology* 15, no. 2 (April 1983), 238.
14. Masters, 133.
15. Ned Block, "On a Confusion About a Function of Consciousness," *Behavioural and Brain Sciences* 18, no. 2 (June 1995): 227–247.
16. Masters, 134.
17. Karen Leigh-Post, *Mind-Body Awareness for Singers* (San Diego, CA: Plural Publishing, 2014), 16.
18. Bruce Mangan, "The Conscious 'Fringe': Bringing William James Up to Date," in Bernard J. Baars, William P. Banks, and J.B. Newman eds., *Essential Sources in the Scientific Study of Consciousness* (Cambridge, MA: MIT Press, 2003), 741–760.
19. Masters, 135.
20. For example: Liam J. Norman, Charles A. Heywood, and Robert W. Kentridge, "Object based attention without awareness," *Psychological Science* 24, no. 6 (June 2013): 836–843.
21. Taylor W. Webb, Hope H. Kean, and Michael S.A. Graziano, "Effects of Awareness on the Control of Attention," *Journal of Cognitive Neuroscience* 28, no. 6 (June 2016): 842–851.

ANNIVERSARY FACTOID

First Annual Convention
of
N. A. T. S.

Date — February 13–14, 1945

Place — Hotel Statler,
Detroit, Mich.

[*The Bulletin* 1, no. 1 (October 1944)]

CONVENTION CANCELLED

In order to cooperate with the defense program announced by the Government, the convention of the National Association of Teachers of Singing, Inc., scheduled for Detroit in February has been cancelled.

More complete details of this announcement will be found in other reading columns of this issue of the Bulletin.

[*The Bulletin* 1, no. 2 (January 1945)]