

## Distraction and Partial Attention

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*Consider the neurologic processes that are involved in thinking. More than a decade ago, Ratey (2002) described the activities involved in thinking as being: reception, perception, comprehension, storage, manipulation, monitoring, controlling, and responding to a steady stream of incoming sensory data. Now, consider the four stages of memory: sensory register, short term memory, working memory, and long term memory. During much of our daily routines we are subjected to a nearly endless stream of sensory input. Part of the incoming stimulation from the environment is encoded and stored, while other elements are lost; and that is a good thing! “One of the functions of working memory is to prevent some information from being code” (Ratey, 2002, p. 196). Attention and distraction both play major roles in learning, and they can be thought of as being two sides of the same coin. The remainder of this article addresses the issue of what happens to the processes of thinking and learning when impacted by distraction and partial attention.*

### Our Need for Focused Attention

One of the first definitions of “attention” was provided by William James: “Focalization and concentration of consciousness are of its essence. It implies withdrawal from some things in order to deal effectively with others...” (James 1890/1950, p.403). Two interesting characteristics of attention include 1) our tendency to focus on what we value (but not necessarily what is most important) and 2) noticing what is unique, novel, or unexpected. However, in order to optimally focus, we need to *inhibit* distractions. Since the brain is attracted to novelty, it can be described as actively seeking distractions (Miller, 2011), which typically will interfere with learning. The job of working memory is a constant one, preventing the encoding of information that is not intended or needed for further processing.

Although it has long been reported that certain parts of the brain are designed for and dedicated to performing specific tasks, the neurology is actually much more complicated. For the sake of simplicity, we will review a few areas of the brain and consider what it is known about their function as related to attention and memory. The **prefrontal cortex** is generally recognized for its role in executive functioning. Most important, it plays the lead role when we deliberately focus. It is very adaptive, responds to a variety of cognitive demands, and absorbs an immense amount of information. Located near the prefrontal cortex is the **frontal cortex**, often referred to as the seat of working memory and information processing, usually working in tandem with the prefrontal cortex. The **parietal cortex** plays a role in taking in and processing what we see. It is tuned in to actively seeking visual and spatial sensory information from our surroundings, whether or not that information is specifically important to us.

In addition to seeking visual input and dealing with thought and the processing of information from our immediate environment, these areas compete with the **cingulate gyrus**, a part of the limbic system that also actively detects novelty; i.e., it too is looking for distractions. Of much interest as of late is the role of the **hippocampus**, central to memory functions and often considered to be the “first stop” in memory production. The **striatum**, which is believed to take a more predominant role during multitasking and performance of repetitive tasks, is known to be inefficient when it comes to transfer and generalization of information. A point to contemplate is whether the presence of distractions, partial attention, and multitasking are giving our brains adequate opportunity to do what they are wired to do: process our experiences, store them as new memories, and connect them with other stored memories.

The above information is important to consider when making decisions about what to teach, how to teach, and what students are expected to learn and retain. In order for the brain to function effectively as related to learning, it needs to be provided with the appropriate input and an opportunity to focus and encode. This requires that students be given sufficient time to think, and with the expectation that they focus, integrate, and store new information.

Recall the role of the prefrontal cortex. There is a limit to how much the prefrontal cortex can hold and process at one time, but also a limit on what one can **do** with the information. If we try and do too much, our output will lose accuracy and/or quality. Distractions and partial attention interfere with higher order thinking skills. It is very difficult to do something with more than one chunk of information at a time; i.e., especially to perform more than one cognitive process. When we attempt to do so, quality suffers and errors increase. The more variables that tempt our attention, and the more ways we can be distracted, then the more difficult it is for the prefrontal cortex to function effectively.

### Partial Attention and Multitasking

Linda Stone (as quoted in Rock, D., 2009, 35-36), one of Microsoft's former vice presidents, wrote, "To pay continuous partial attention (CPA) is to keep a top-level item in focus, and constantly scan the periphery in case something more important emerges." What is the impact of CPA? Stone noted that the impact is one of constant and intense mental exhaustion (Stone, L., 2009). One of the issues noted by Stone was that of the mental "energy" required when constantly scanning, but a second issue

is related to our ability to effectively focus while doing so. A decade ago, Restak (2003) noted that the brain is designed to work best on a single task at any given moment in time. We should avoid activities that interrupt the flow of focus on a primary activity when we need to process and store the information. If storing and remembering are not a primary concern, then partial or fractured attention take less of a toll.

If two activities activate noncompeting parts of the brain, interference and competition are avoided or minimized. Multitasking is quite do-able when different parts of the brain are being used, but the more similar the activities, the less efficient and accurate we become at performing them. There is still a “penalty” for multitasking noncompeting activities, but a less severe one than when two activities share the same neurology.

Continuous partial attention and distractions related to multitasking share some neurologic similarities; they involve “cognitive switching”. These include active as well as passive distractions that divide our attention and result in reaction time “switching costs”; that is, the time lost as we switch mental gears while changing from one activity to another. They both interfere with the encoding process, causing task delay and quite possibly lapses in memory due to the lack of focus. As noted by Restak (2003), “Focused concentration and practice can enable most of us to achieve a superior performance if we are willing to put in the necessary work” (pg. 27). Multitasking interferes with the opportunity to perform that work and to achieve superior performance.

## To Summarize

For more than twenty years science has shown that performing two tasks concurrently during the encoding process reduces memory of the task ( Craik, Govoni,, Naveh – Benjamin , & Anderson, 1996). It is clear that effective encoding requires concentrated attention. On the positive side, allocation of attention to the process of encoding is to a large extent under our awareness and control. That is, it is not something that just happens spontaneously; we generally have the ability to control our attention. It is important for students to understand that at the point of encoding, formation of a memory trace requires *conscious attention* to the material (Fernandes & Moscovitch, 2000). Partial attention typically will not get the job done.

Learning requires active and purposeful thinking. It involves the integration of information and requires analysis and synthesis to develop higher level concepts. Students need to be provided with the opportunity to reconstruct, reassemble, and associate new information with the old. When incoming information is connected with stored memories, biological changes occur in the brain. These changes increase the size and complexity of the neuronal connections, but all of these processes require focused attention. The processes of accessing and using information that is in memory, associating it with other information, and synthesizing it for later use can be taught, but schools must provide the time for students to acquire and practice these skills. Distractions that cause us to commit only partial attention to the task at hand will not result in effective retention and learning.

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