

## Lecture two: Attention

Attention is an important cognitive ability. It has been studied in conjunction with many other topics in neuroscience and psychology including awareness, vigilance, saliency, executive control, and learning.

### 1. Definition

Attention is the ability to choose and concentrate on relevant stimuli. It's not just about centering our focus on one particular thing; it also involves ignoring a great deal of competing information and stimuli. Attention allows us to "tune out" information, sensations, and perceptions that are not relevant at the moment and instead focus our energy on the information that's important. Attention is the cognitive process that makes it possible to position ourselves towards relevant stimuli and consequently respond to it. This cognitive ability is very important and is an essential function in our daily lives. Luckily, attention can be trained and improved with the appropriate cognitive training.

### 2. Types of attention

Attention is a complex process that we use in almost all of our daily activities including learning, listening to a lecture, taking notes, etc. **Scientists have found out that attention is not a single process, but rather a group of attention sub-processes. Sohlberg and Mateer (1987, 1989) provided a model of attention which subdivides it into the following parts:**

- **Arousal:** Refers to our activation level and level of alertness, whether we are tired or energized.
- **Focused Attention:** Refers to our ability to focus attention on a stimulus.
- **Sustained Attention:** The ability to attend to a stimulus or activity over a long period of time.
- **Selective Attention:** The ability to attend to a specific stimulus or activity in the presence of other distracting stimuli.
- **Alternating Attention:** The ability to change focus attention between two or more stimuli.
- **Divided Attention:** The ability to attend different stimuli or attention at the same time.

Examples of attention use

We use attention in our daily lives in a countless number of tasks.

- When we drive, we are almost constantly using all of our attentional sub-processes. We have to be awake (arousal), we have to be able to focus our attention on the stimuli on the road (focused attention), pay attention for long periods of time (sustained attention), keep ourselves from getting distracted by irrelevant stimuli (selective attention), be able to change focus from one lane to another, to the mirror, and back to your lane (alternating attention), and be able to carry out all of the actions necessary for driving, like using the pedals, turning the wheel, and changing gears (divided attention).
- Attention is one of the first and most important aspects of studying at home or at school. When you study, you need to be awake and attentive to whatever you're reading or hearing. Sustained attention is especially important when you study because reading the same information while you try to learn can become boring and monotonous after a while.

Sustained attention helps you stay focused on studying for hours, which helps keep you from losing time and forgetting information that you've read.

- Poor attention may cause you to forget what you're doing and throw the spoon in the trash and put the empty carton in the fridge.

### **3. Attentional problems**

Attention is necessary for the proper functioning of our other cognitive skills, which is why an alteration in any of the attentional processes may make any daily activity more difficult to complete. However, it's important to remember that it's completely normal for attention levels to vary throughout the day, and having trouble paying attention mid-afternoon does not necessarily mean that there is any presence of an alteration.

Some factors that may affect attention levels are tiredness, fatigue, high temperatures, consuming drugs or other substances, as well as a number of others.

### **4. Attention and Learning**

Attention, through its role in determining what enters memory, guides learning. Attention could help make efficient use of data by directing learning to the relevant components and relationships in the input. In addition to deciding which portions of the data to process, top-down attention can also be thought of as selecting which elements of the network should be most engaged during processing. Attention and learning also work in a loop. Specifically, attention guides what is learned about the world and internal world models are used to guide attention. The global workspace theory of consciousness says that at any moment a limited amount of information selected from the brain's activity can enter working memory and be available for further joint processing ([Baars, 2005](#)). Conscious attention is required for the learning of many complex skills such as playing a musical instrument. However once fully learned, these processes can become automatic, possibly freeing attention up to focus on other things ([Treisman et al., 1992](#)). The mechanisms of this transformation are not entirely clear but insofar as they seem to rely on moving the burden of the task to different, possibly lower/more reflexive brain areas.

### **5. Theories of attention**

Broadbent (1958) is credited with the first model of attention, often described as a “bottleneck theory” because information had to be filtered to restrict the flow to a cognitively manageable amount (Anderson et al., 2002). He hypothesizes that people have an internal, intentional selection or filtering method that directs attention to focus on certain stimuli over others. His filter theory was a serial processing “early-selection” model where the filtering

occurred in the early stages of information processing based on physical properties, such as pitch or volume. In the bottleneck model, attention is directed to the information that passes the filter or to salient information that leads to a shift in attention limited by single channel processing (Anderson et al., 2002).

In the 1960s, Treisman adapted Broadbent's model to what became known as attenuation theory. Her research challenged the notion of a solely early-selection model. He argued that we do not completely filter out all unattended information; we attenuate some information based on both physical properties and semantic selection criteria.

Deutsch and Deutsch (1963, in Anderson, 1995) continued to modify the filter model. Based on their research, they developed a late-selection theory.

### **Sources**

[Frontiers | Attention in Psychology, Neuroscience, and Machine Learning | Frontiers in Computational Neuroscience](#)

[Attention- Cognitive Ability \(cognifit.com\)](#)

[How Psychologists Define Attention \(verywellmind.com\)](#)