Cognitive Psychology

3rd Year LMD

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**Lecture 3: Attention**

**Attention**

Attention is the **ability to choose and concentrate on relevant stimuli**. 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.

**Types of Attention**

Attention is a complex process that we use in almost all of our daily activities. Over time, scientists and researchers have found out that attention is not a single process, but rather a group of attention sub-processes. The most accepted model for the attention sub-components is currently the hierarchical model from Sohlberg and Mateer (1987, 1989), which is based on clinical cases of experimental neuropsychology. According to this model, attention can be divided 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.

**Attentional Systems and Neuroanatomy**

According to the neuroanatomical model from Posner and Petersen (1990), there are three different attentional systems. They are the following:

* **Reticular Activating System (RAS) or Alert System**: This system is mainly in charge of Arousal and Sustained Attention. It is closely related to the reticular formation and some of its connections, like the frontal areas, limbic systems, the thalamus, and the basal ganglia.
* **Posterior Attentional System (PAS) or Orientation System**: This system is in charge of Focused Attention and Selective Attention of visual stimuli. The brain areas related to this system are the posterior parietal cortex, the lateral pulvinar nucleus of the thalamus, and the superior colliculus.
* **Anterior Attentional System (AAS) or Execution System**: This system is in charge of Selective Attention, Sustained Attention, and Divided Attention. It's closely related to the prefrontal dorsolateral cortex, the orbitofrontal cortex, the anterior cingulate cortex, the supplementary motor area, and with the neostriatum (striate nucleus).

Examples of Attention

* 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.
* Attention is also essential for any type of work, from office jobs that have a certain amount of reading or writing, to air traffic controllers, athletes, cashiers, drivers, doctors, and CEOs. Every profession requireseverykind of attention.
* We use attention in our daily lives in a countless number of tasks. From the time we wake up to when we go to bed, we are constantly using different types of attention. 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. Avoiding this, reading, watching a movie, making food, showering, or meeting up with friends all require attention.

ADHD, Inattention, and other Disorders Associated with 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. Excessive attentional states (typical of delirious states) are known as hyperprosexia. The contrary is known as hypoprosexia or inattention.

**Attention Deficit Hyperactive Disorder** (ADHD) or **Attention Deficit Disorder** (ADD) are probably the most well-known disorders with a strong component of altered attention. ADHD is characterized by a difficulty controlling and directing attention to a stimulus and controlling behavior in general. The brains of people with ADHD have been shown to have a series of anatomical differences in the nucleus accumbens, the striate nucleus, the putamen, the amygdala, the hippocampus, prefrontal areas, and the thalamus. These neuroanatomical differences and symptoms may be the consequence of late brain maturation.

Aside from ADHD and ADD, there are a number of other disorders that are characterized by an attentional alteration. Altered states of consciousness, like **coma** (or aprosexia), a **vegetative state**, and a **state of minimal conscinsiousness** all have alterations in Arousal or in focused attention and more complex attentional sub-processes. These disorders are caused by brain damage like **stroke** or **chronic traumatic encephalopathy (CTE)**. Brain damage may also cause other attentional problems like distractibility or excessive fatigue, or other more specific problems like **heminegligence**, **dementias** like **Alzheimer's Disease**. On the other hand, **anxiety disorders** or **depressive disorders** tend to have an increased attentional level, specifically toward negative or anxiety-producing stimuli.