

When the heart and the brain are teaming up, do things get more efficient?

This 1-day workshop, organized by Advanced Neuro Technology (ANT BV, Enschede) and the department of Industrial Design (TU/e), is intended for professionals. It shows how a multi-modal and model-based approach can be used to improve the quality and efficiency of a biofeedback therapy. During the first part of the workshop, we demonstrate how multimodal measurements, such as multi-channel EEG and heart rate variability, can be used to evaluate stress relaxation and the startle response. During the second part of the workshop, different feedback strategies will be compared: EEG, biofeedback and a combined approach.

A startle reflex is the natural defensive response of the brain and body to a sudden stimulus such as a loud sound or a flash of light. A typical expression of this startle reflex is a current contraction of the muscles, an increased heart rate, eye blinks and a change in specific EEG frequency oscillations. These responses are associated with stress mechanisms and their expression has been investigated in various studies.

In the first part of the workshop, the effect of stress and the startle reflex on various electrophysiological parameters will be explained. After this, we demonstrate how to measure these response by using the ANT ASA-lab software. Electrophysiological measurements from different modalities are combined to increase the sensitivity and specificity of stress assessment (i.e. brain potentials, heart rate variability, skin resistance, the activity in the orbicularis oculi muscles).

During the second part of the workshop, we discuss how a model-based approach can facilitate the design of a biofeedback system. We will cover that a good model combines 1) knowledge about the (open loop) relationship between electrophysiological responses and the state of the client, which was measured in the first part of the workshop; but also that it incorporates 2) information about the biofeedback software itself. Theories from game design can guide us here. In a hands-on experiment we will explore different settings for a biofeedback signal. Both uni- and multimodal feedback approaches will be created. The ANT Neurofeedback module is used to facilitate a quick & easy implementation of the game.