# Introduction

# Neuroergonomics: a review of applications to physical and cognitive work

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MENTAL WORKLOAD

-The advent of the cognitive revolution in the late 1950s lead to the introduction of the cognitive approach in human performance assessment from the 1960s to the present day, but there was still a relative neglect of brain mechanisms. Advances in neuroimaging and related methods that lead to the development of the field of cognitive neuroscience lead to the argument that neural measures should also be considered in human factors and ergonomics ([Parasuraman, 2003](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/" \l "B63)). Since that time, the neuroergonomic approach has been applied to a number of different issues in cognitive ergonomics.

🡪 huge hindrance is the reliance on measures like eeg and fmri

🡪therefore we take a mobile approach using peripheral measures, relying on sympathetic indicators

-The assessment of human mental workload is one of the most widely studied topics in ergonomics ([Wickens and McCarley, 2008](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/" \l "B93)). If operator mental workload is either too high or too low human-system performance may suffer in work environments, thereby potentially compromising safety

-The dominant theory of human mental workload is resource theory ([Wickens, 1984](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/" \l "B90), [2002](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/#B91)). This theory postulates that except for highly overlearned “automatic” tasks, task performance is directly proportional to the application of attentional resources.

System Qualities (Acceptance)

-There are many factors, such as cost, ease of implementation, intrusiveness, etc., that must be taken into consideration when selecting neuroergonomic techniques for mental workload assessment. Some of these factors (e.g., cost) may rule out the use of neuroergonomic methods in favor of simpler indexes such as subjective measures. Some workers may also not wish to be “wired up” for physiological recording, so operator acceptance must also be carefully considered. However, with increasing miniaturization and development of dry electrode, wireless, wearable systems, some of these concerns are diminishing.

VIGILANCE MENTAL FATIGUE

-The evaluation of operator vigilance and mental fatigue in work environments is a topic closely related to workload assessment. The widespread implementation of automation in many work environments, including air and surface transportation and health care, while often leading to a reduction in operator workload, can also increase workload because of the resulting need for monitoring the automation ([Parasuraman, 1987](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/" \l "B61)). The typical finding in vigilance studies is that the detection rate of critical targets declines with time on task ([Davies and Parasuraman, 1982](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/#B14)).

- The deleterious effects of loss of operator vigilance can countered with reduced work hours and more frequent rest breaks, but this may not be practical in all work settings. Another mitigating strategy is to use cueing. Detection performance in vigilance tasks can be improved by providing observers with consistent and reliable cues to the imminent arrival of critical signals, with the extent of the decrement being reduced or eliminated ([Wiener and Attwood, 1968](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/#B94)). With cueing, observers need to monitor a display only after having been prompted about the arrival of a signal and therefore can husband their information processing resources over time.

🡪 Info cueing as a method of neuroergonomics

### TRAINING AND NEUROADAPTIVE SYSTEMS

-While the goal of ergonomic design is to avoid having workers exposed to extremes of workload and to loss of vigilance, this may not always be possible in certain work settings where unexpected events, equipment failures, or other unanticipated factors lead to a transient increase in the task load imposed on the human operator, or long work hours impose demands on operator vigilance. Adaptive automation offers one approach to deal with these issues ([Parasuraman, 1987](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/" \l "B61), [2000](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/#B62)). In this approach, the allocation of functions to human and machine agents is flexible during system operations, with greater use of automation during high task load conditions or emergencies and less during normal operations, consistent with the approach of dynamic function allocation ([Lintern, 2012](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/" \l "B41)). The adaptive automation concept has a long history ([Parasuraman et al., 1992](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/" \l "B65)), but neuroergonomic methods for its implementation have been considered relatively recently ([Inagaki, 2003](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/#B29); [Parasuraman, 2003](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/#B63); [Scerbo, 2007](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3870317/#B74)).

Why physiological measures?

From **Emotion Recognition Based on Weighted Fusion Strategy of**

**Multichannel Physiological Signals**

**Wei Wei , Qingxuan Jia, Yongli Feng , and Gang Chen**

-It is imperative to take into account physiological signals

to recognize emotion because of the strong relationship

between physiological reactions and human. Besides, physiological

signals are the result of Central Nervous System

(CNS) and Autonomic Nervous System (ANS) activities,

which are the same among people with different cultures,

languages, and gender and cannot be imitated easily [6].

**Discussion**

-improving the system in terms of emotion recognition by providing learning data with clearly separated emotions and further we could deploy facial recognition for emotion classification because it can also be applied in a very non obstrusive from and is known to work?!