**Time Based Resource Sharing model as a mean to improve cognitive load measurement**

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Cognitive Load Theory (CLT) aims at improving learning efficiency by providing a theoretical framework allowing the discovery of several empirical effects. One of the main limits on CLT research is the cognitive load measure (Paas, Tuovinen, Tabbers & Van Gerven, 2003). The same authors proposed to use a measure that would take time into account since dynamic changes of cognitive load during the task performance would be hidden by an average rating (Xie & Salvendy, 2000). Here we argue that adopting a dynamic Working Memory model (i.e., the Time Based Resource Sharing, TBRS, Barrouillet, Bernardin & Camos, 2004) and a continuous measure (i.e., Electroencephalography, EEG), will improve cognitive load measurement.

The TBRS model describes Working Memory (WM) solicitation (i.e., Cognitive Load) as a tradeoff between the time needed to refresh elements held in WM and the time needed to perform distracting tasks. Regarding the question of cognitive load measurement, two EEG band frequencies have been related to cognitive load variations: the theta (4-8Hz) and the alpha (8-12Hz) bands (Kramer, 1990; Borghini et al., 2014). Theta spectral power has been shown to increase with WM load while alpha band power is assumed to decrease with the number of elements held in WM and to increase with the necessity of inhibiting distracting items (Capilla et al., 2014).

In this experiment, we directly replicated a previous work on the TBRS model (Barrouillet et al., 2007, experiment 2) with the addition of EEG measurement. Participants performed a complex span task involving meaningless series of letters. The series started with three items and increased in length up to eight letters. After each item, participants had to respond to a series of spatial judgment tasks requiring them to decide if a square presented on screen was on the upper half of the screen or the lower one. At the end of the series, they had to recall the letters in the correct order. Spatial judgment task varied in two modalities of difficulty to manipulate the time available to refresh items held in WM.

Preliminary results (n=6) suggest that EEG indeed allows a measure of cognitive load, sensitive to both number of items to hold in WM and to time ratio manipulation. From a descriptive viewpoint, theta spectral power seemed to increase with the number of relevant elements to be held in WM. It also appeared to be sensitive to the time ratio, shorter time available to refresh items held resulting in higher theta band level. On the other hand, alpha spectral power appeared to also increase with the series length and with the time ratio manipulation. This increase could reflect a greater need for inhibiting irrelevant items (Capilla et al., 2014). This experiment is currently replicated on a larger sample of participants to allow statistical analysis. Results are discussed in the TBRS model framework and could help advancing cognitive load theory by providing a tool to assess cognitive load during learning situations.