Neural Correlates of Educational Engagement

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Introduction

• Previous research has shown that the neural reliability measured in a small group can be used to predict the behaviors of a large population3 4
• The amount of information retained from stimuli is closely related to the level of engagement with the stimuli.
• **Hypothesis:** The level of neural reliability evoked by educational stimuli, as measured via the inter-subject correlation (ISC) of electroencephalography (EEG), predicts both attentional engagement and learning.

Methodology

• EEG was recorded from 20 subjects while they watched short educational videos.
• The duration of the videos ranged from 142 - 388 s (247 ± 121.8 s).
• Video-related background knowledge and knowledge growth were measured before and after the videos using multiple choice questions.
• ISC components were derived by maximizing the correlation between the neural responses of different individuals (Figure 1).
• The correlation between each individual’s evoked responses and their peers (ISC) was used as a metric for their relative attentional engagement with the stimuli.
• After the first video presentation, subjects watched the videos again while counting backwards from 1000 towards 0 in decrements of 7. This served as a distracting condition to assess the ISC’s ability to discriminate between attentional states.

Results

• Subjects who exhibited high levels of ISC, also had high scores on the post-video test as could be seen in figure 2 ( p = 0.01) and figure 3 (c=0.47 , p= 0.038).
• ISC was also able to distinguish the attentional state of subjects with perfect accuracy (Figure 4).

Discussion

• ISC may be considered as a biomarker of the stimulus-related attentional mechanisms necessary to achieve comprehension.
• In the future, ISC may be used as a metric when designing and assessing educational content and presentation style.

References