INTRODUCTION

Though technical advances have improved P300-based BCI paradigms, user errors still exist. Given the attentional focus required for successful BCI performance, general lapses of attention and mind wandering represent one potential source of user errors. Would bolstering attentional resources improve user performance? To examine this possibility, we employed a Mindfulness Meditation and Induction (MMI) technique to induce a heightened state of attentional awareness immediately prior to BCI use. We expected MMI to sustain attention to the target item, providing two important consequences for BCI users: 1) reduce distraction from non-targets and thereby increasing accuracy; 2) produce higher amplitude P300 responses; and reduce P300 response latencies.

METHODS

Subjects: 18 healthy (11 female) students (mean age = 22.5, age range = 18 - 53) recruited from ETSU psychology subject pool.

Paradigm: Subjects were assigned to either a 6-min MMI (N=9) or a non-MMI control group (STD; N=9). All subjects were presented with a 6x6 matrix of items on a computer monitor and were instructed to focus attention on the target items (910 target / 4550 nontarget flashes).

Data Acquisition and Analysis: 16-channel EEG was recorded (BCI2000, gUSBamp) using a right mastoid reference at 256 samples/sec and bandpass filtered (range = 0.05 to 30 Hz). Database was sampled at 256 samples/sec and bandpass filtered (range = 0.05 to 30 Hz).

PERFORMANCE MEASURES

Accuracy was analyzed using a 2 (Attentional Condition, MMI & STD) X 13 (Number of Sequences, 1 – 13) repeated measures factorial ANOVA. MMI produced higher accuracy than STD. Accuracy increased with more sequences. The interaction was also significant; accuracy in the MMI condition remains consistently higher.

Conclusions

1. These data suggest that MMI leads to better P300 based BCI performance via increases in sustained attention than standard row/column presentation without MMI.
2. MMI may produce higher amplitude P300 responses and shorter target latencies on all channels with a larger cohort of subjects and a more rigorous MMI training protocol.

REFERENCES


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