Refining the methodology of alpha electroencephalographic biofeedback and exploring its effect on cognition and mood

Results:

EEG biofeedback did not result in any clear changes in EEG, either within or across training sessions for three of the four locations. There was also no clear difference in behavioural performance of the EEG training group compared to those receiving mock feedback.

However, for the Russian group the results showed that alpha biofeedback training enhanced the alpha peak frequency, width and power in the individual upper alpha range, but only for participants with a low baseline alpha peak frequency (<10 Hz). In contrast, the mock biofeedback increased resting alpha power only in participants with high baseline resting alpha frequency. With regards to changes in cognitive performance those given real EEG biofeedback training showed evidence of improving their response times and accuracy when completing a mental rotation task. Though this was only seen for those with lower individual alpha peak frequencies (<10Hz). Similarly, those receiving real feedback that had low peak alpha also showed improved performance on a conceptual span memory task. There was also a reduction in anxiety levels for those given real feedback with high peak alpha.

The findings are less clear and robust than we had originally anticipated. The various reward thresholds seemed to have little impact on the effectiveness of the training. However, given the overall lack of effects this may be due to other aspects of the methodology. With regards to effects of EEG biofeedback on cognition there were only main effects of Time suggesting that improvements over time were the result of practice rather than the intervention. The differences found for the Russian cohort may be the result of specific cultural influences which we hope to explore further.

Published works:

Published Articles
Bazanova, O., & Vernon, D. (2013). Interpreting EEG alpha activity. *Neuroscience and Biobehavioral Reviews*. doi: 10.1016/j.neubiorev.2013.05.007

Bazanova, O. (2010). Individual alpha peak frequency variability and reproducibility in various experimental conditions. *Zh Vyssh Nerv Deiat Im I P Pavlova, 60*(6), 767-776.

Vernon, D., Dempster, T., Bazanova, O., Rutterford, N., Pasqualini, M., Andersen, S. (2009). Alpha neurofeedback training for performance enhancement: reviewing the methodology. *Journal of Neurotherapy, 13*, 1-13.

Area(s) of interest:

Neurofeedback, optimal performance, EEG and cognition.

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