Neurofeedback is the instrumental conditioning of different EEG parameters, which can be done by rewarding or inhibiting certain features of the brain activity. Research has shown (Gevensleben et al., 2010; Kayiran et al., 2010; Kouijzer et al., 2009; Ros et al., 2009; Sterman, 2005; Vernon et al., 2003) that a variety of neurofeedback protocols have been used successfully in the treatment of several disorders (e.g., attention deficit disorder, autism, epilepsy, post-traumatic stress disorder, addiction, depression, fibromyalgia...). Neurofeedback may be a promising method of treatment for people with Schizophrenia, although little is known about its use. The enhancement of cognition plays a key role in the modern treatment of Schizophrenia, relying on the evidence that neurocognitive deficits are core features of the illness and significant determinants of functional outcome (Gewin et al., 2000, 2004). Given that neurofeedback has been shown to be effective at improving attention, memory, executive functioning, medication and self-control in other neuropsychiatric disorders, we hypothesize that neurofeedback constitute a good candidate for the cognitive enhancement of people with Schizophrenia and with related disorders. This exploratory study examined the feasibility of using neurofeedback as a bio-behavioral method to enhance neurocognitive performance in schizophrenia.

Objective

1. Objective

Participants


Instruments

All patients completed pre and post-treatment assessments of social and neurocognition based on the MATRICS Consensus Cognitive Battery: Continuous Performance Test – Identical Pairs (measures sustained attention or vigilance); the participant is required to focus on a computer screen that presents various numbers and to press a button whenever two matching stimuli appear on consecutive trials. NAB Mazes (measures executive functioning and problem solving); consists of seven timed paper-and-pencil mazes of increasing difficulty. Letter-Number Sequencing (measures verbal working memory); the respondent remembers random numbers and letters and then is asked to recall the numbers in order (from smallest to largest) and then the letters (in alphabetical order), with increasing trial length. DISC-Measuring Emotions (measures social cognition); the respondent chooses actions that are most effective in obtaining a specific motivated outcome for an individual in a story.

Intervention

From October 2010 to January 2011, patients were assigned to a neurofeedback operant conditioning training of the 10-13Hz band and the 13-15Hz band initially at C4 (reference at A1) and then at FCz (reference at A2), while inhibiting theta and high beta. The reward of 12 or 13 Hz (SMR band at C4 while inhibiting theta 4-7Hz) is a standard protocol effective to increase attentional skills and executive functioning. Thompson and Thompson (2009) also observed changes in the EEG patterns during the treatment, suggesting a learning effect. Patients were very collaborative during the treatment sessions and showed increased interest in their performance. Results from this exploratory study support the feasibility of using neurofeedback to enhance neurocognitive performance in schizophrenia, but this method should not be considered alone for this purpose. This results also provides preexcusance findings to support a complete controlled trial.

Results and conclusions

Following treatment, patients showed evidence of improved performance in different cognitive measures. The most important and consistent increases were observed in attention/vigilance, working memory and processing speed. We also observed changes in the EEG patterns during the treatment, suggesting a learning effect. Patients were very collaborative during the treatment sessions and showed increased interest in their performance. Results from this exploratory study support the feasibility of using neurofeedback to enhance neurocognitive performance in schizophrenia, but this method should not be considered alone for this purpose. This results also provides preexcusance findings to support a complete controlled trial.

4. Bibliography