Brain Painting – BCI meets patients and artists in the field

Harry George¹, Adi Hösle², Dirk Franz³, Andrea Kübler¹,³

Email: harry.george@uni-wuerzburg.de

¹Department of Psychology I, Biological Psychology, Clinical Psychology and Psychotherapy, University of Würzburg, Germany
²Babenhausen, Germany, contact@retrogradist.de
³Institute of Medical Psychology and Behavioural Neurobiology, University of Tübingen, Germany

Today's Brain-Computer Interface (BCI) systems have been primarily developed to assist in replacing the abilities lost by patients diagnosed with motor-neuron diseases such as amyotrophic lateral sclerosis (ALS). Of which, the most important ability appears to be communication [1], represented by the volume of research into such applications currently under development worldwide. Another valuable element of human life however is that of creative expression. Modification to a P300-BCI communication system has yielded an application which provides the ability for such expression, Brain Painting.

Brain Painting [2] works by replacing individual fields in a P300-BCI based control matrix with painting functions, such as cursor control and shape/colour selection to produce images of an abstract nature (see Fig. 1). Brain Painting is now used regularly by several ALS patients (n = 4) throughout Germany as a form of entertainment and as a way to satisfy the desire for creative articulation in their own homes. Furthermore, prominent German artists (n = 6) have been invited to use Brain Painting at their ateliers. Constructive feedback has been collected from these various users in an effort to improve the application. Important metrics being assessed are ensuring the application is intuitive to use, robust in reliability and practical for unsupervised use in daily life.

Quantitative results initially suggest information transfer rate variations amongst subjects; healthy participants display prominent P300 responses thus requiring 20% less repetitions in comparison with patients. Qualitatively are the results outstandingly positive, enthusiastic comments from both patients and artists confirm that importantly they experience satisfaction and are entertained when using the application, with a repeated strong desire to re-use the system. To date, patients using the system have produced numerous images from independent sittings lasting upwards of 1.5 - 2 hours. This is unquestionable evidence for an BCI solution which is providing a positive and useful difference to the lives of ALS patients.

Brain Painting satisfies some basic human needs and it is hoped that the possibilities offered assist in improving the Quality of Life for patients with severe motor disabilities. Modifications to the application and stimulus presentation are being initiated to improve the reliability and prominence of the P300 response amongst patients where life sustaining apparatus presents a challenge to the mounting or operation of BCI devices. Thus acceptance of Brain Painting within the artist community and most importantly the patient community is a key factor of the project to ensure its long term success.

References


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Fig 1: Image produced by an ALS patient using Brain Painting