

Music and Neuroscience

by Centre Scientific Research (CSR)

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Abstract—The study has just completed a three year study of responses of individuals with Disorders of Conscious (DOC), or Vegetative and Minimally Conscious States (VS and MCS) to music therapy treatment. The treatment involved performance of preferred music and simple music performed in time to respiration. Whilst some patients were diagnosed as unaware of themselves or their surroundings (i.e. VS), they displayed selective responses to music therapy that one can observe (i.e. behavioural responses) and measure through changes in heart rate, respiration and brain activity (i.e. neurophysiological responses). According to research, these responses may be supportive of neuroplasticity, the process whereby the damaged brain develops compensatory connections, or repairs itself when stimulated. This study will build on this research to establish the value of music therapy in the rehabilitation of those with DOC.

Keywords—*Music, Neuroscience, Brain development, Sound Neurofeedback, Sound effects, MusicTherapy, enculturation*

I. INTRODUCTION:

The Investigator has just completed a three year study of responses of individuals with Disorders of Conscious (DOC), namely Vegetative and Minimally Conscious States (VS and MCS) to music therapy methods [O'Kelly et al. 2013]. In contrast to their diagnosis of VS, which assumes no awareness, some patients displayed selective neurophysiological and behavioural responses to music therapy. Furthermore significant increases in cortical activity in frontal and temporal areas were observed across patients for music therapy compared to a range of auditory stimuli. According to the literature, these responses may be supportive of neuroplasticity and provide prognostic indicators [Särkämö, T, Wijnen et al. 2006; Riganello, Dolce, and Sannita 2012; Wilson et al. 1996]. However there is little robust research examining any non pharmacological rehabilitation treatments, let alone music therapy with DOC.

Therefore, a study is proposed which might establish the value of music therapy in the rehabilitation of those with DOC, and the validity of early neurophysiological and behavioural responses

for providing prognostic information to guide the rehabilitation process.

II. METODOLOGY:

For this study, in accordance with National Research Ethics Service requirements and guidelines (Department for Constitutional Affairs, 2005), the patients will be recruited after consulting close contacts of the patients for their views regarding the likely wishes of the patient. The Patients will be randomly allocated to receive 2 weeks of a music therapy treatment followed by 2 weeks of 5 minutes of listening to a preferred text narration, by their favorite author, 5 minutes of preferred music performed live, and 5 minutes silence .The treatment protocol will be performed by the chief investigator or the music therapist investigator. New studies will be done on the effects of musical experience in children on enculturation to Arabic and Classical Music.

III. Ethical Considerations:

Music is a non invasive modality which has been used for over 30 years in the treatment of those with DOC. The principal investigator has just completed a study using both liked, disliked and white noise stimuli with 21 DOC patients, where no adverse reactions were observed. The paper detailing this study in draft form is attached for information. No adverse effects for the finger cuff, EEG electrodes or respiration belt have been recorded during this study or to the investigators knowledge elsewhere. The study requires the patients involvement for a total of 12 hours over a 6 week period, followed by 2 one hour assessments. Patients will only be recruited once they have received a full SMART assessment, during which period there is less demands on their time for routine clinical care and assessment. The principal investigator is integrated within the hospital multi disciplinary team, and as such can schedule treatments around routine care which will take priority at all times.

IV. FUNDING

The technologies used, and the ability of the investigators to disseminate findings might be greatly enhanced by additional funding.

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