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The Effect of pT-TMS on Theta, Alpha and Beta Rhythm in Autism Children

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Abstract

The purpose of this research was to study the theta, alpha and beta rhythm in 10 children who diagnosed with autism disorder before and after the application of pico Tesla transcranial magnetic stimulation (pT-TMS) . The study population included 4 boys and 6 girls, with ages ranged from 6-12 years (mean± SD: 9 ± 1.8). A whole-head 122-channel gradiometer was used in a room that was magnetically shielded. It was sawn that after the use of pT-TMS most patients had an improvement in their clinical symptoms. We concluded that the treatment with pT-TMS affect theta, alpha and beta rhythm in children with autism disorder inspiring additional studies to be conducted.

Keywords: MEG; Fourier transform; Autism disorder; Theta; Alpha; Beta

Introduction

Autism disorder is a persistent developing disorder described by deficits in public communication, linguistic, stereotyped behaviors, and limited variety of attention. Anninos and Tsagas device [1] is a head covering including up to 122 coils that were organized in five array groups, so as to cover frontal, vertex, right - left temporal, right - left parietal and occipital region. It was used to generate pT-TMS range modulations of magnetic flux in the alpha frequency range 8-13 Hz on every single subject as the proper physiological frequency. We have examined additionally more frequencies as well as other forms of oscillations earlier but there were no effects. The pT-TMS device generates a square wave so as to look like with the firing activity of neurons in the brain [2-9]. In our study we used this electronic device in order to avoid upper level of TMS since this could have side effects to children.

This research is a continuation of our previously published work investigating the delta and theta rhythm after the treatment with pT-TMS in children with autism disorder using a double-blind experimental design [2] and the beta rhythm in autism children [3]. In the current study we investigate the theta, alpha and beta rhythm in children with autism disorder after the treatment of pT-TMS.

Materials and Methods

Biomagnetic data were recorded with the use of a whole-head 122-channel magnetoencephalograpy (MEG) (Neuromag-122, Neuromag Ltd. Helsinki, Finland) [2-9] in a room that it was electromagnetically shielded. Our study population consisted of 4 boys and 6 girls with autism, with ages vary from 6-12 years (mean± SD: 9±1.8). The Investigational Review Board of our University approved the research. The parents gave informed permission for the method and the purpose of the research.

Each child was comfortably seated on a non-magnetic chair in a magnetically shielded room covered by the helmet-shaped Dewar and had eyes closed. In order to prevent artifacts. We visually inspected the MEG data tracings off-line and cut off periods contaminated with artifacts. We took 3 min recording for each child in order to certify awareness. The sampling frequency of resting state MEG recordings was 256Hz. We filtered the frequencies cut – off 0.3 and 40Hz. Our laboratory made a software program in order to identify the amplitude of the major leading frequency of the power spectra of the MEG following the use of Fast Fourier Transform (FFT). We used the FFT algorithm to find the first dominant frequency of the theta, alpha and beta rhythm.

Results

All children had the same clinical characteristics before the treatment with pT-TMS (severity level 1). They exhibited persistent deficits in social interaction and communication; reduced sharing of emotions and interests; difficulties in making friends; failure to start or react to public relations and intellectual disability. (Table 1) shows the medical characteristics of every child after treatment with pT-TMS one-month. (Table 2) shows the theta, alpha and beta frequencies in the autistic children previously and afterwards the treatment with pT-TMS. (Figure 1) illustrated the numbers of Table 1 in one graph. We observe the behavior of the three rhythms in each autistic child previously and afterwards the treatment with pT-TMS.

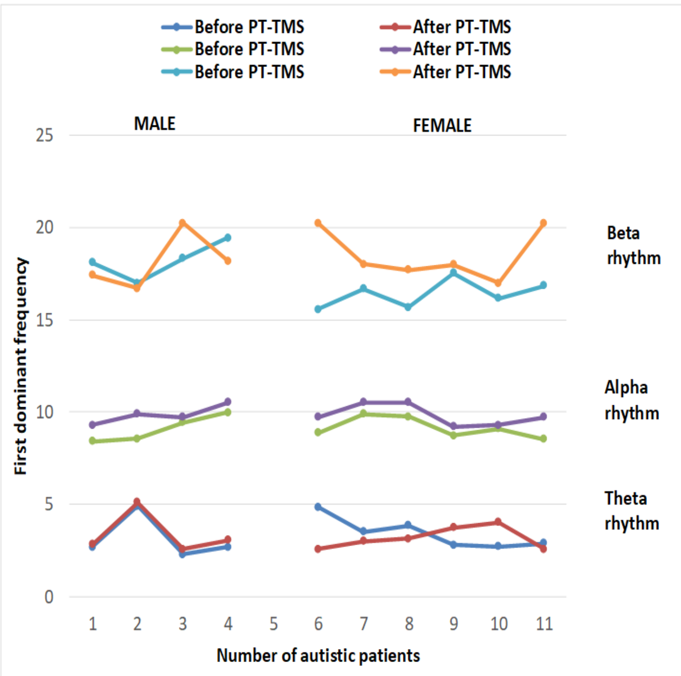

Figure 1: *Exhibits the theta, alpha and beta rhythms for every child prior to and after the treatment with pT-TMS.*

Table 1: *The table shows the symptoms of each child, in the list of disorders, following one-month pT-TMS application at home.*

Patient	Age	Sex	After pT-TMS
1	9	M	Normal changes and behavior
2	8	F	Normal changes and behavior
3	8	F	Major changes
4	8	F	Mixed changes
5	6	M	Major changes
6	9	F	Minor changes
7	12	M	Minor changes
8	11	F	Major changes
9	7	F	Major changes
10	8	M	Minor changes

Table 2: *Autistic patients (bpT-TMS: Before magnetic stimulation; apT-TMS: After magnetic stimulation).*

Patient	Age	Theta		Alpha		Beta	
		bpT-TMS	apT-TMS	bpT-TMS	apT-TMS	bpT-TMS	apT-TMS
1(M)	9	2.67	2.80	8.39	9.30	18.1	17.41
2(M)	8	4.89	5.1	8.55	9.89	17.00	16.70
3(M)	6	2.28	2.56	9.42	9.71	18.32	20.24
4(M)	12	2.66	3.05	9.98	10.5	19.43	18.20
5(F)	8	4.84	2.56	8.87	9.71	15.56	20.24
6(F)	9	3.50	2.99	9.89	10.50	16.67	18.02
7(F)	11	3.85	3.13	9.75	10.50	15.69	17.70
8(F)	11	2.79	3.71	8.72	9.20	17.52	18.00
9(F)	8	2.69	4.00	9.10	9.30	16.16	17.00
10(F)	8	2.87	2.56	8.52	9.71	16.84	20.24

Discussion

The mechanism of the action of the extremely small magnetic fields (pT-TMS) is undetermined. However, one prospective cause is that these magnetic fields have been demonstrated to affect the action of the pineal gland (PG) that controls the endogenous opioid functions, the dopaminergic modulation, and GABA. Two patents established the function of PG after pT-TMS [1,8]. Anninou and Tsagas patent [8], showed the improving of the immune system which is regulated by the PG. Anninos and Tsagas patent [1], shown the decalcification of epiphysis by

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means of magnetic fields with characteristics defined by MEG and the pT-TMS device. Alpha rhythm is correlated to PG. Since the maximum appearance of alpha rhythm has been known to happen with puberty, it is potential that the formation of alpha rhythm is dependent to neuroendocrine influences. Nocturnal plasma melatonin levels have been demonstrated to decrease gradually during childhood reaching a lowly point at puberty This progressively decrease in melatonin secretion throughout childhood enables the maturation of alpha rhythm. So, the change of alpha rhythm could be used as a neurophysiological indicator for the action of the PG and for the disorders related with missing or late development of the alpha rhythm such as autism, dyslexia, epilepsy, Parkinson etc, which might be associated to disturbances of PG melatonin functions in early lifetime [10].

Conclusion

We concluded that the pT-TMS is a method that effects non-invasively and improves the symptoms in most of the autism patients. Additional investigations with a larger number of patients and replication of the pilot results by other research centers are required.

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