Task-fMRI Group and Functional Connectivity Analysis of the Brain During Faradarmani Consciousness Field Connection

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Abstract

Mohammad Ali Taheri has introduced "T-Consciousness," from which T-Consciousness Fields originate, as one of the fundamental constituents of the universe, in addition to matter and energy. These fields are neither matter nor energy, but they can be proven through scientific experiments. In this study, the Faradarmani Consciousness Field (FCF), which is one of Taheri's Consciousness Fields has been applied. A Faradarmangar (Faradarmani practitioner) is a trained individual who has the ability to apply T-Consciousness Fields. The fMRI task plays an important role in understanding the specific functions of various regions of the human brain during different cognitive activities. This study was conducted with the aim of investigating group analysis and functional connectivity in the brains of Faradarmangars during Connection with the FCF, and using task-fMRI, various activated and deactivated brain regions were identified during this Connection. Clusters that showed a significant difference in peak intensity between the task group and the rest group were selected as seeds for seed-voxel analysis. After identifying activated and deactivated networks, group differences in functional connectivity analysis were used. In this study, an fMRI-based representation of Connection with the FCF is reported. Group analysis of the data showed activation of the frontal lobe (BA6/BA10/BA11) during Connection with the FCF. Furthermore, seed-based functional connectivity analysis showed decreased connectivity between activated clusters and the posterior cingulate gyrus (BA31). In addition, increased connectivity was observed in deactivated clusters and the frontal lobe (BA11/BA47) during Connection with the FCF. The activated clusters, as well as the increased and decreased connectivity between different brain regions during Connection with the FCF, first confirm the significant influence of the FCF, and second, reveal the distinct pattern of Connection with this non-material and non-energy Field at the brain level.

Keywords: Faradarmani Consciousness Field, T-Consciousness Fields, Functional Connectivity, Task-fMRI

Introduction

For over a century, researchers have tried to discover how cognitive activities work in the brain. Functional magnetic resonance imaging (fMRI) is a powerful, non-invasive technique that allows researchers to look at the living brain while a person performs a specific task, thereby seeing which parts of the brain are active during that task [1]. Activation in brain regions is defined by changes in the blood oxygen level-dependent (BOLD) signal [2]. In other words, activity in a specific brain region is accompanied by increased blood flow to that region, which supplies the oxygen and glucose needed for neural activity. fMRI is increasingly used to investigate dysfunction in diseases such as Alzheimer's [3, 4], Parkinson's [5, 6], schizophrenia [7, 8], and others. Furthermore, fMRI is particularly suitable for screening the effects of drugs on pain processing in the human central nervous system [9].

Studies of functional activities have also been used to clarify the level of functional connectivity between different brain regions. Functional connectivity is defined as the temporal dependence between neurophysiological events that are physically distant from each other [10, 11]. Biswal and colleagues were the first to show that there are high degrees of temporal correlation both within and across the sensorimotor cortex of the brain at rest [12, 13]. Various studies have reported connectivity between the left and right motor cortex during rest [14].

The default mode network (DMN) is known as the brain system that is preferentially active when individuals are not focused on the external environment [15, 16]. Additionally, the DMN has been involved in self-referential mental activities [17]. Goal-directed behaviors cause a decrease in activity in brain regions including the medial prefrontal cortex, medial and lateral parietal cortex, and limbic and paralimbic regions, which are considered the default network [18]. Among these regions, the medial prefrontal cortex (mPFC) primarily shows decreased activity during goal-directed behaviors in fMRI studies [17]. It has been reported that DMN activity and connectivity are involved in the integration of cognitive and emotional processing [19], as well as in mind-wandering [20]. Furthermore, numerous studies have investigated changes within this network in disorders of cognitive dysfunction such as schizophrenia [21–23] and depression [24].

Many researchers have long investigated the issue of the mind-body relationship, behavior, and specific regions of the brain. The reductionist approach that some researchers take suggests that each part of the brain has a specific functional role [1]. Chen and colleagues (2019) provided evidence for the architecture of directed information networks in the cerebral cortex using resting-state fMRI, stating that the configuration features of information flow in the baseline state (rest) underlie cognitive ability in humans [25]. Numerous research projects have been conducted to investigate how the mind interacts with the brain and the major neural changes in this interaction; for example, the brain under meditation or mindfulness states has been extensively studied. Several studies indicate that mindfulness is associated with brain activation or connectivity in multiple brain regions [26]. According to a systematic review, mindfulness increases insular cortex activities in seven brain regions. However, they found no strong evidence for increased activities in the lower regions of the prefrontal cortex [27]. Recently, an fMRI study during Transcendental Meditation practice showed that blood flow patterns are higher in the anterior cingulate and lateral posterior prefrontal cortex but lower in the pons and cerebellum [28]. It has been reported that meditation is associated with decreased DMN activities compared to performing an active task in meditation, compared to the control group [29]. Similarly, it has been shown that in several different meditations, including focus, loving-kindness, and choiceless awareness, the DMN (prefrontal cortex and posterior cingulate) is deactivated compared to the control [30].

In the current century, the nature of ‘consciousness’ and its place in the world of science have received much attention, and many philosophical and scientific theories have been proposed in this field. In the 1980s, Mohammad Ali Taheri introduced new fields with a non-material and non-energy nature, which are called T-Consciousness Fields (T-Consciousness Fields). In this view, T-Consciousness is one of the

three elements existing in the universe, in addition to matter and energy.

The effect of T-Consciousness Fields is initiated by a trained individual, known as a *Faradarmangar*, through a brief moment of attention. These Fields cannot be directly measured by science, but their effects on various subjects can be investigated through repeatable experiments [31]. In previous research, it was observed that the MCF-7 cancer cell line [32], wheat plants under salt stress [33], and an animal model of Alzheimer's disease [34] were significantly affected by the Faradarmani Consciousness Field (FCF). More details about Taheri's Consciousness Fields theory and types of experimental studies are presented in a review study [35].

Also, in a previous related study [36], the electrical brain activity during Faradarmani Connection was investigated in a population of Faradarmangars, and it was observed that the power of the 34–40 Hz frequency band in the frontal lobe increased significantly. This increase was mainly in the medial frontal gyrus (BA6), and subsequently in the central lobule of the brain, during the task of Connection with the FCF, compared to the resting state (without Connection) in the same population of Faradarmangars. In the present study, in order to complement and further develop the aforementioned previous investigations, brain activity in the population of Faradarmangars was examined using the fMRI technique. The aim of this study is to investigate the specific behavior of the human brain during Connection with the FCF, using task groups and functional connectivity analysis.

Method

In the present study, group task-fMRI analysis and functional connectivity analysis were performed on a population of Faradarmangars, and the activity of their brain regions was compared during task and rest. The task refers to the activity during which the Faradarmangar connects to the Cosmic Consciousness Network. This study was approved by the Ethics Committee of Iran University of Medical Sciences (Approval ID: IR.IUMS.REC.1399.29).

Participants

The participants in this study were 20 healthy individuals (males and females in equal numbers) with a history of at least two years of activity as Faradarmangar. The age range of the samples was between 20 and 50 years (MD = 35.5 ± 9.16).

Task Design

In this study, three rest blocks (Rest 1, 2, and 3) and two task blocks (Task 1 and 2) were defined, and the study began with a rest state (Figure 1). The purpose of this design, in addition to providing conditions for observing greater differentiation between task and rest states, was also to examine changes in brain activity when switching from task state to rest state. Prior to this study, the possibility of disconnecting from the T-Consciousness Field after initial initiation had not been experimentally studied. Therefore, in this study, we examined the ‘disconnection’ referred to as Rest 2 and 3 between the states of Connection with the FCF (Task blocks 1 and 2).

The task in this study is the establishment of Connection by the defined participants with the FCF. At the beginning of each task block, a sound is played and participants are asked to close their eyes and initiate this Connection during their fMRI scan. The study began with a rest state (without Connection to the FCF) and with eyes open, and the total scan time in both task and rest states was 15 minutes per person. In the rest blocks, a fixed point (+) is displayed for 180 seconds. All comparisons in this study were between the task and rest states within the same group of participants.

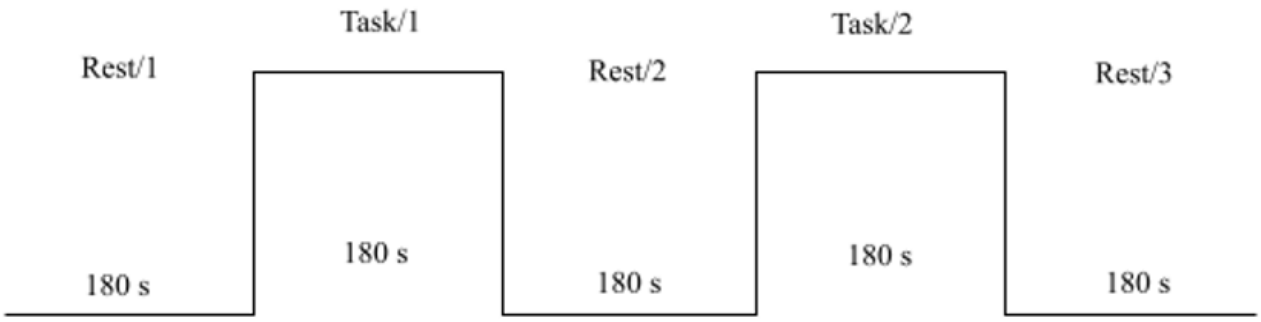


Figure 1. The Task-Rest block design and their duration in the present study

fMRI Data Collection

Brain imaging was performed at the National Brain Mapping Laboratory (Tehran, Iran). Participants were positioned in the MRI scanner, and foam pads were used to minimize head motion and improve the signal-to-noise ratio (SNR). Data were acquired using a 3-Tesla MRI system (Siemens MAGNETOM Prisma) equipped with a standard 20-channel head coil. Three-dimensional T2*-weighted functional images were acquired using blood oxygen level-dependent (BOLD)-sensitive gradient-echo echo-planar imaging (EPI), with an echo time (TE) of 30 ms and a repetition time (TR) of 3000 ms. During each TR, 34 axial slices were obtained with a flip angle of 90°, a 64 × 64 acquisition matrix, a field of view (FOV) of 210 mm, and a voxel size of 3 × 3 × 3 mm. Functional scanning consisted of 248 volumes for each participant. High-resolution whole-brain structural images were acquired for each participant using a T1-weighted MPRAGE sequence (TR = 1800 ms, TE = 3.74 ms, flip angle = 7°, 176 slices, FOV = 256 × 256 mm, voxel size = 1 × 1 × 1 mm).

fMRI Task Analysis

Task fMRI analysis was performed using the Statistical Parametric Mapping software package (SPM12) (Wellcome Department of Cognitive Neurology, London, UK). The preprocessing stage included fieldmap correction, realignment, co-registration of functional and anatomical scans, normalization, and smoothing. Additionally, low-frequency noise was removed by applying a high-pass filter (cut-off period = 100 seconds) to the fMRI time series at each voxel. Head motion was checked, and the threshold was considered to be less than the voxel size (3 mm). Significant hemodynamic changes for each condition were investigated using a general linear model with boxcar functions convolved with a hemodynamic response function. Statistical parametric maps were calculated for each t-statistical contrast on a voxel-wise basis.

Group and Functional Connectivity Analysis of fMRI

Preprocessing of data for fMRI connectivity analysis was performed using the CONN toolbox (version c19) (Whitfield-Gabrieli and Nieto-Castanon 2012). The analysis includes the following steps:
1- Estimation and correction of participant head motion

2- Slice timing correction

3- Segmentation of different brain regions (gray/white/CSF) and normalization of data into MNI standard space.

Following that, in the denoising step, fMRI signals are passed through a 100-degree filter to remove the effects of respiratory and cardiac noise from the signal. In order to perform functional connectivity analysis, the peak coordinates of activated clusters in the fMRI data analysis were considered as seeds with a radius of 10 mm. Functional connectivity analysis was performed using generalized psychophysiological interaction (gPPI) [37] at the first-level analysis stage. Effects are reported according to the contrast for activated networks (Task>Rest) and for deactivated networks

(Rest>Task) across all participants in the seed-to-voxel analysis. At the second-level analysis stage, for each participant, the gPPI model average BOLD time series of each seed from the corresponding functional images was calculated as the representative of that seed, and was correlated using Pearson correlation analysis with the time courses of all brain voxels.

Statistical Analysis

In the fMRI analysis, a paired t-test was used to create contrasts, and the p-value was set at 0.05. In the functional connectivity analysis, statistical significance for all comparisons was set at $p < 0.05$, FDR-corrected at the cluster level (cluster threshold), and $p < 0.001$ uncorrected at the voxel level (height threshold).

Results

Activated and Deactivated Brain Regions

Activation and deactivation of brain regions during Connection with the FCF were measured, as shown in Figure 2. As illustrated in this figure, the frontal-parietal lobes of both brain hemispheres show a significant increase in activity during this task. On the other hand, the temporal and occipital lobes of the left and right hemispheres become deactivated during Connection with the FCF.

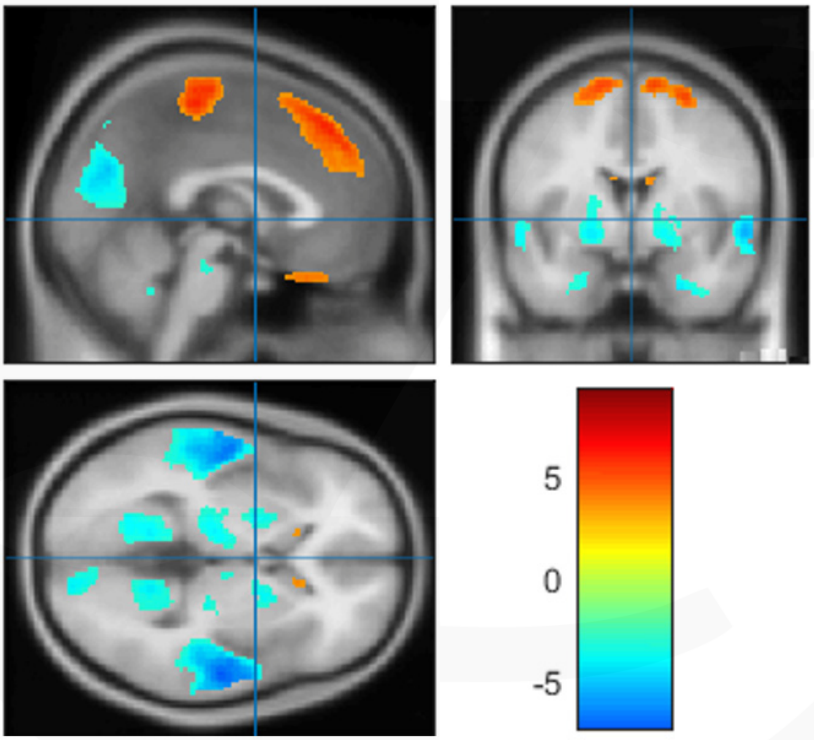


Figure 2. Activated and deactivated brain regions during 'Connection' with the Faradarmani Consciousness Field in the Faradarmangar population of the present study (red indicates higher activity and blue indicates lower activity)

The three-dimensional display of activated and deactivated brain regions during the task is shown in Figure 3.

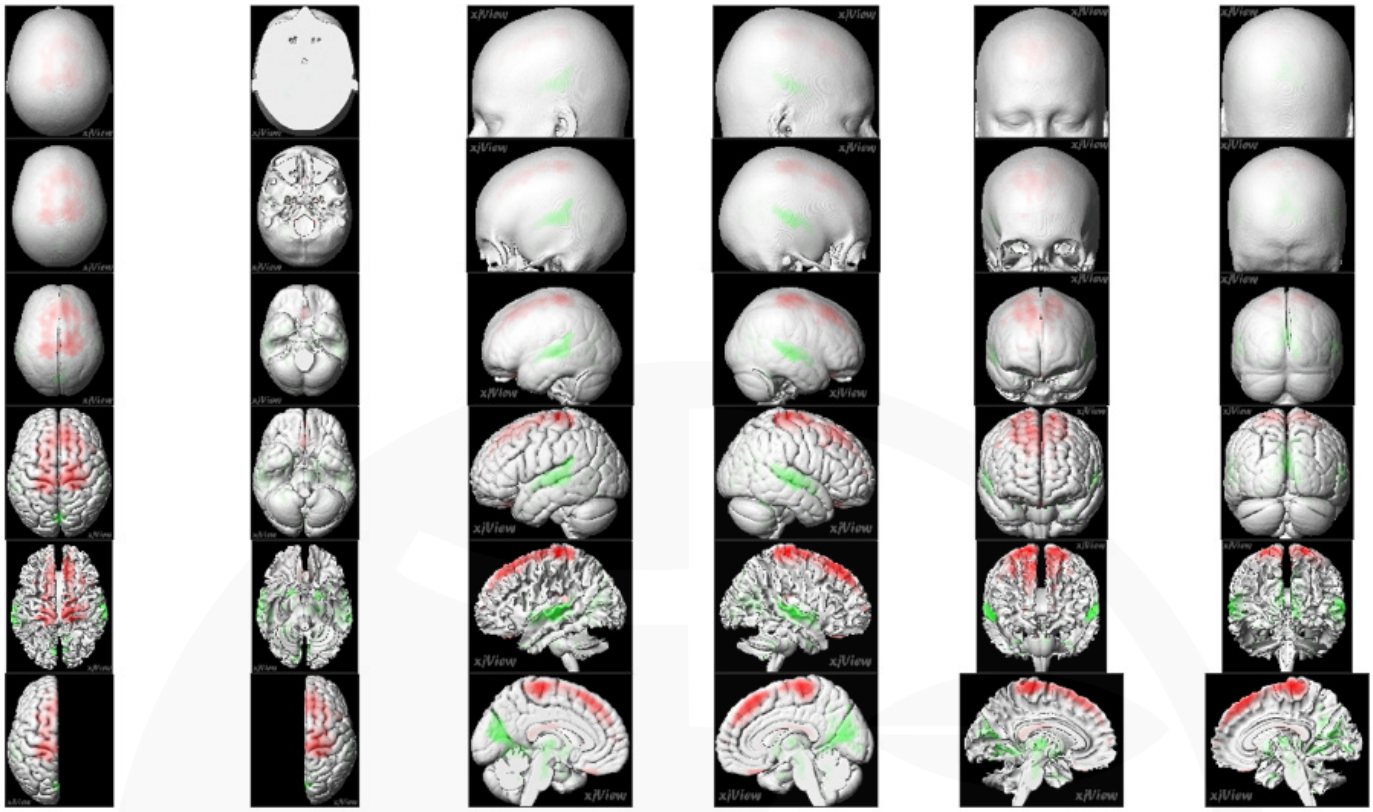


Figure 3. Three-dimensional view of the brain of the Faradarmangar population during the fMRI task (Faradarmani Consciousness Field Connection) in all directions (top, bottom, sagittal, and dorsal views).

An interesting point is that during FCF Connection, there is symmetry in the activated and deactivated regions, which is significantly different compared to the rest state (Figure 3). The comparison of task contrasts from Reset1 and all Reset blocks in activated and deactivated regions is shown in Figure 4.

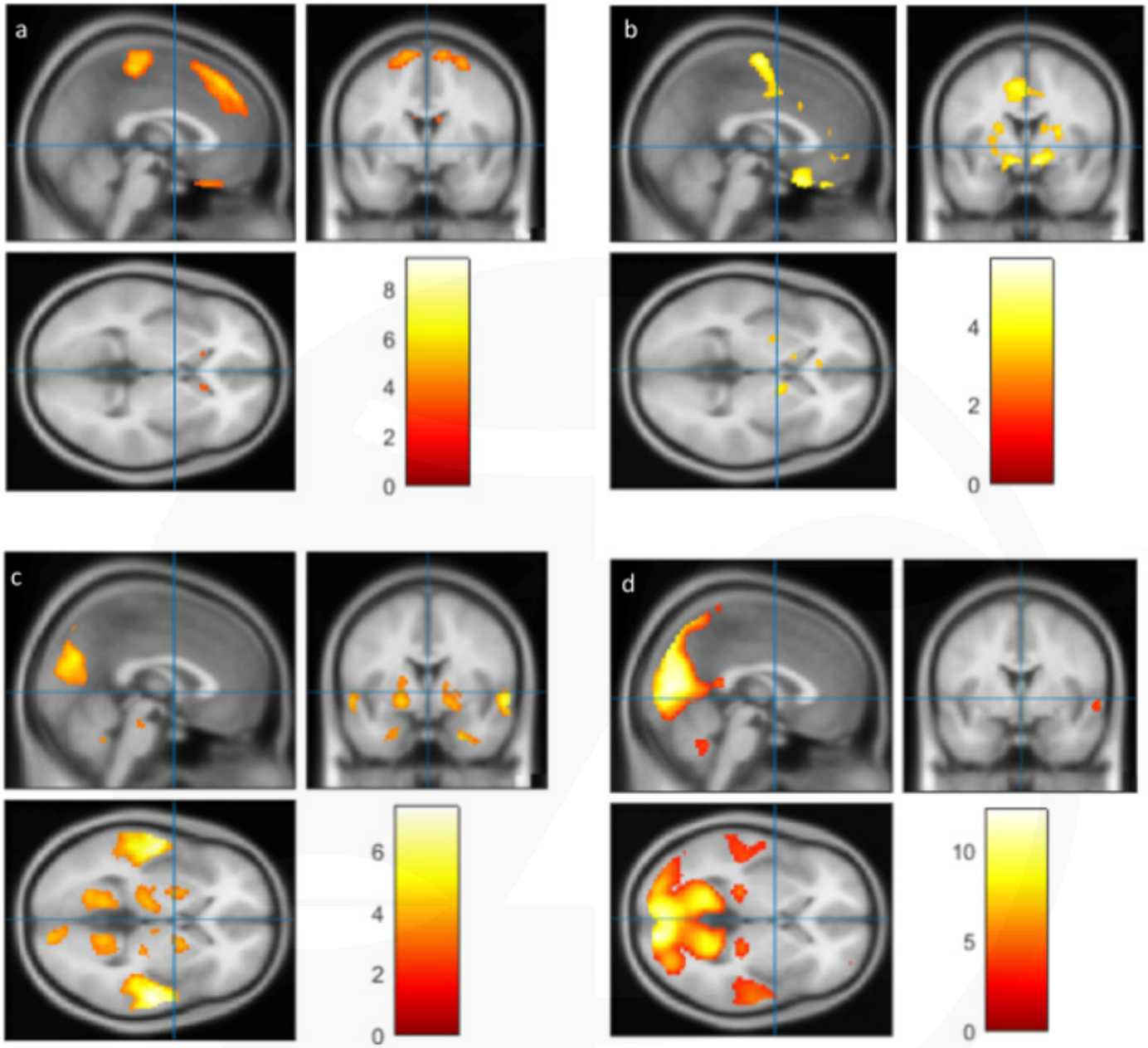


Figure 4. Activated and deactivated brain regions in the Faradarmangar population during Connection with the Faradarmani T-Consciousness Field; Activated in: (a) Task > Rest, (b) Task > Rest 1, and deactivated in: (c) Rest 1 > Task, and (d) Rest > Task.

As shown in Figure 4, considering different rest states leads to significant changes in the intensity and the activated and deactivated regions in the brains of Faradarmangars. For better clarity, three sagittal views (a) and (c) from Figure 4 have been expanded and are shown in Figure 5.

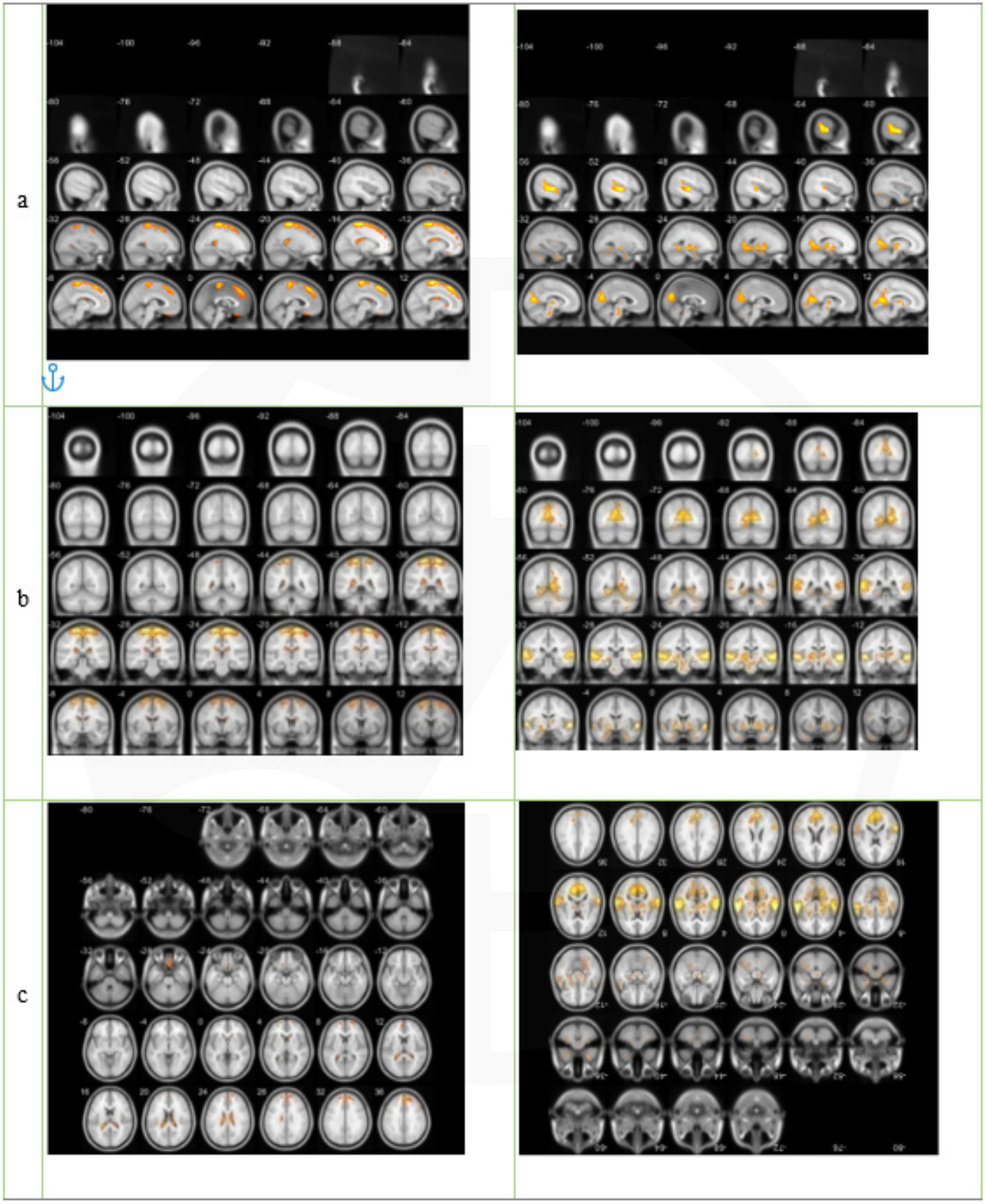


Figure 5. Activated (left) and deactivated (right) brain regions of Faradarmangars during Faradarmani Consciousness Field Connection in Task>Rest1 and Rest1>Task, respectively, in (a) sagittal, (b) coronal, and (c) transverse views.

Analysis of Activated and Deactivated Clusters

The activated and deactivated clusters during Faradarmani Consciousness Field Connection were measured and are shown in Tables 1 and 2, respectively. The threshold for this analysis was set at p-value = 0.001, intensity = 3.0916, and cluster size = 5.

Table 1. Number of voxels, peak MNI coordinates, associated regions, and intensity in activated clusters during Faradarmani Connection. Activated clusters with a voxel count in the order of 1000 are highlighted in gray.

Activation clusters	Number of voxels	Peak MNI coordinate	Cerebrum	Lobe	Peak MNI region	Peak intensity
1	173	-4 34 -28	Left	Frontal	Rectal Gyrus (BA11)	4.1921
2	16	-10 24 -20	Left	Frontal	Medial Frontal Gyrus	3.6603
3	18	12 22 0	Right	Sub-lobar	Caudate_R (aal)	3.5045
4	14	-14 22 2	Left	Sub-lobar	Caudate_L (aal)	3.3306
5	6	-32 -48 2	Left	Sub-lobar	Lateral Ventricle	3.563
6	33	-16 62 6	Left	Frontal	Medial Frontal Gyrus	3.8461
7	56	20 64 6	Right	Frontal	Superior Frontal Gyrus (BA10)	3.963
8	396	-20 -38 14	Left	Sub-lobar	Lateral Ventricle	5.2362
9	225	18 -28 20	Right	Sub-lobar	Caudate	4.7855
10	8993	14 -24 72	Right	Frontal	Precentral Gyrus	9.1736

As shown in Table 1, the right and left frontal lobes, as well as the subcortical regions of the brain, become activated during the FCF Connection (more than 50 voxels). The most active regions are observed in the Precentral Gyrus in the white matter of the right frontal lobe (BA6). Following that, the left and right subcortical regions, as well as BA11 and BA10, are also activated regions.

Table 2. Number of voxels, peak MNI coordinates, associated regions, and intensity of deactivated clusters during the Faradarmani Consciousness Field Connection. Deactivated clusters with a voxel count in the order of 1000 are highlighted in gray.

Deactivation clusters	Number of voxels	Peak MNI coordinate	Cerebellum	Lobe	Peak MNI coordinate region	Peak intensity
1	45	28 -52 -52	Right	Cerebellum Posterior	Cerebellar Tonsil	-3.6114
2	29	20 -42 -42	Right	Cerebellum Posterior	Cerebellar Tonsil	-3.7023
3	36	-32 -48 -34	Left	Cerebellum Anterior	Culmen	-3.5606
4	121	26 0 -34	Right	Limbic	ParaHippocampal_R (aal)	-4.5244
5	1293	-24 -22 -6	Left	Sub-lobar	Optic Tract	-5.1218
6	193	32 -44 -34	Right	Cerebellum Anterior	Culmen	-3.837
7	11	2 -54 -34	Right	Cerebellum Anterior	Vermis_9 (aal)	-3.3818
8	6	10 -26 -34	Right Brainstem	undefined	Pons	-3.1819
9	43	46 -50 -28	Right	Cerebellum Anterior	Culmen	-3.8079
10	8	-28 -56 -24	Left	Cerebellum Posterior	Declive	-3.3039
11	2023	58 -18 0	Right	Temporal	Superior Temporal Gyrus	-7.3881
12	51	8 -20 -16	Right Brainstem	undefined	Midbrain	-3.7833
13	39	-32 -72 -14	Left	Occipital	brodmann area 18 // Fusiform_L (aal)	-3.6249
14	145	30 -16 -12	Right	Sub-lobar	Hippocampus_R (aal)	-4.4384
15	4271	12 -60 10	Right	Limbic	Calcarine_R (aal)	-5.3935
16	491	18 2 -8	Right	Sub-lobar	Extra-Nuclear	-4.2654
17	2153	-54 -14 0	Left	Temporal	Superior Temporal Gyrus	-6.6313
18	15	32 -80 -10	Right	Occipital	Inferior Occipital Gyrus	-3.57
19	23	-34 -8 18	Left	Sub-lobar	Insula // brodmann area 13	-3.6764
20	14	-44 14 18	Left	Frontal	Sub-Gyral	-3.392
21	17	56 -62 22	Right	Temporal	Superior Temporal Gyrus // brodmann area 39	-3.4743
22	9	34 -28 22	Right	Sub-lobar	Extra-Nuclear	-3.4575

The most deactivated regions (more than one thousand voxels) during the FCF Connection are shown in Table 2. The highest level of deactivation is observed in the white matter of the right limbic lobe in the Calcarine region, followed by the gray and white matter of the right and left temporal lobes in the superior temporal gyrus (BA22). Finally, deactivation was also observed in the white matter of the left subcortical region in the optic tract.

Functional Connectivity Analysis

Functionally Related Regions in Activated Areas

The results of the seed-to-voxel analysis are shown in Table 3. These measurements consider the peak activity points in the fMRI analyzed at Task>Rest with an uncorrected P-value < 0.001. Information on voxels that were functionally related to the peak

of activated regions with an uncorrected p-value < 0.001 is presented in Table 4.

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Table 3. Peak activity in the Task-Rest contrast of fMRI data considering a cluster threshold of 50 voxels and FWE = 0.05.

#	X	Y	Z	Voxel
Cluster 1	-4	34	-28	173
Cluster 2	20	64	6	56
Cluster 3	-20	-38	14	396
Cluster 4	18	-28	20	225
Cluster 5	14	-24	72	8993

Table 4. Activation of functionally related clusters in voxels and corresponding regions.

Cluster No.	1
Dimension	x: -4 y: -30 z: +42
Related regions	128 voxels covering 5% of atlas.PC (Cingulate Gyrus, posterior division) 18 voxels covering 0% of atlas.PreCG l (Precentral Gyrus Left) 30 voxels covering 0% of atlas.not-labeled

As shown in Table 4, there is an increase in connectivity between the activated clusters during FCF Connection (Table 3) and the posterior cingulate gyrus. The sagittal view of the functionally related clusters identified, and their effect size are shown in Figure 6.

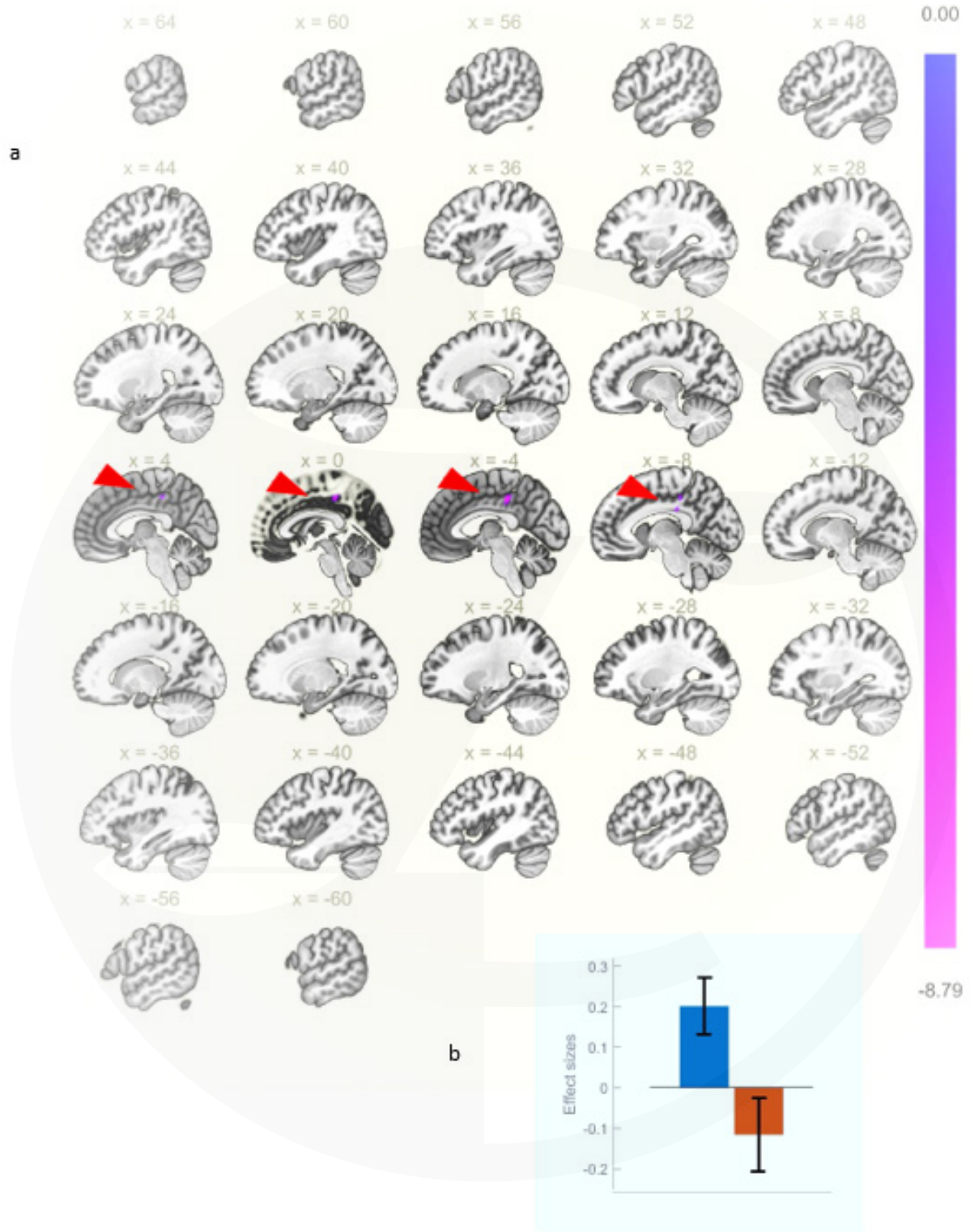


Figure 6. Regions related to functionally activated clusters (red arrow) from a: sagittal view and b: its effect size plot showing Faradarmani Consciousness Field Connection with the red bar.

Functionally Related Regions in Deactivated Areas

The results of the seed-to-voxel analysis, considering the peak activity points of the analyzed fMRI data as seeds (Table 5) in Rest1>Task with an uncorrected p-value < 0.001, are as follows:

Table 5. Peak activity in the Rest-Task contrast of fMRI data considering a cluster threshold of 50 voxels and FWE = 0.05.

Cluster Number	X	Y	Z	# Voxel
1	26	0	-34	121
2	-24	-22	-6	1293
3	32	-44	-34	193
4	58	-18	0	2023
5	8	-20	-16	51
6	30	-16	-12	145
7	12	-60	10	4271
8	18	2	-8	491
9	-54	-14	0	2153

Information on clusters and voxels that are functionally related to the peaks of deactivated regions in the rest state compared to the task (Rest-Task contrast), with an uncorrected p-value < 0.001, is presented in Tables 6 and 7.

Table 6. Deactivation in functionally related clusters.

Cluster	Cluster (x,y,z)	size	size p-FWE	size p-FDR	size p-unc	peak p-FWE	peak p-unc
1	+50 +18 -12	136	0.021966	0.032768	0.000799	0.994287	0.000090
2	+10 +60 -14	147	0.026336	0.045301	0.001105	0.998435	0.000149

Table 7. Deactivation of functionally related clusters in voxels and associated regions.

Cluster	No. of Voxels	Related Regions
1	47	covering 3% of atlas.IC r (Insular Cortex Right)
	34	covering 1% of atlas.TP r (Temporal Pole Right)
	8	covering 1% of atlas.FOrb r (Frontal Orbital Cortex Right)
	4	covering 0% of atlas.Putamen r
	2	covering 1% of atlas.FO r (Frontal Operculum Cortex Right)
	41	covering 0% of atlas.not-labeled
2	61	covering 1% of atlas.FP r (Frontal Pole Right)
	52	covering 1% of atlas.FP l (Frontal Pole Left)
	34	covering 0% of atlas.not-labeled

As shown at the cluster level in Table 6, two clusters with increased connectivity between deactivated clusters during the FCF Connection (Table 5) correspond to regions BA47 and BA11 in the right frontal lobe. The sagittal view of the functionally related clusters, as well as their effect sizes, can be seen in Figures 7 and 8.

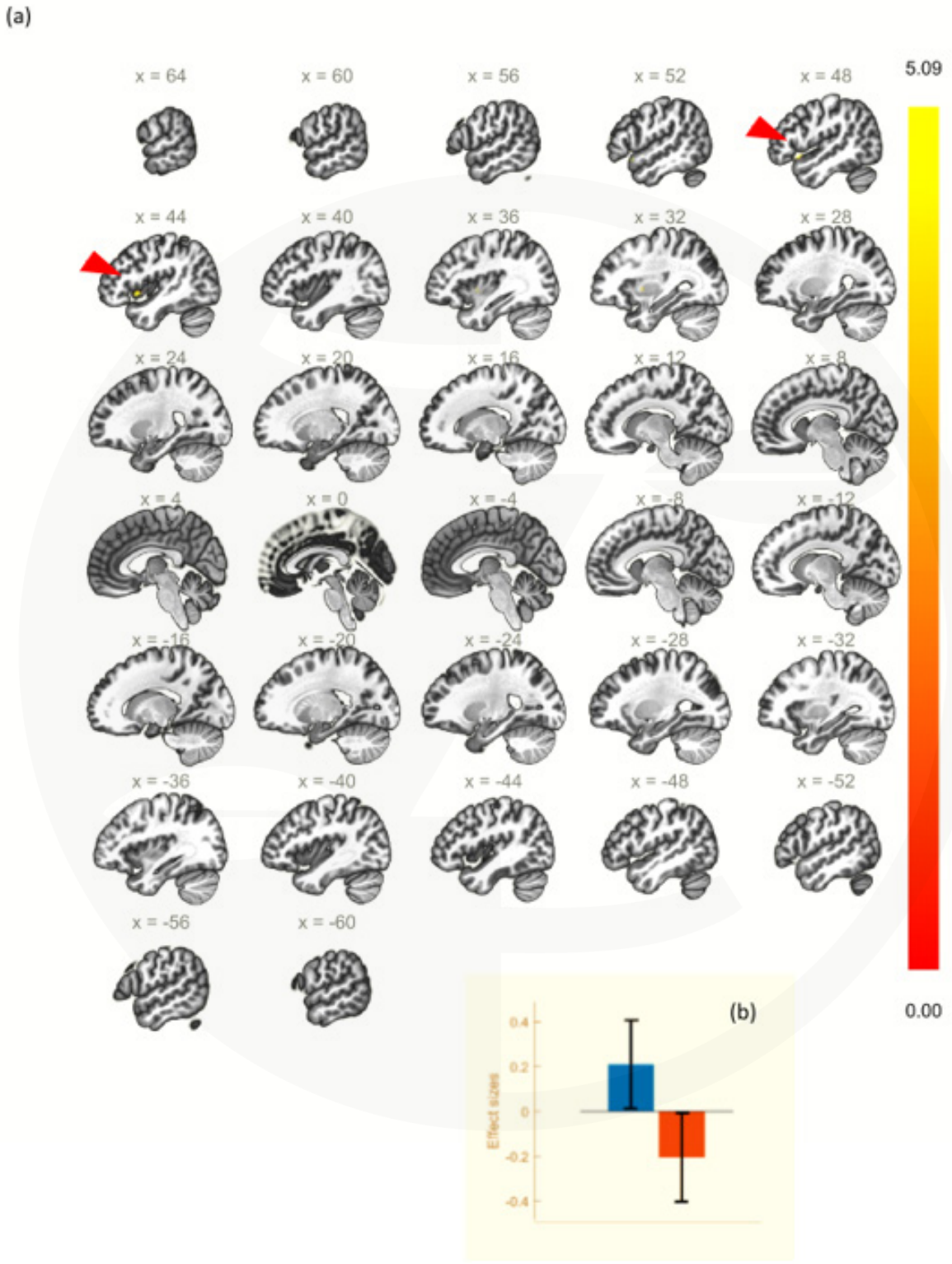


Figure 7. Regions related to functionally deactivated cluster 1 (red arrow) from a: sagittal view and b: its effect size plot showing Faradarmani Consciousness Field Connection with the red bar.

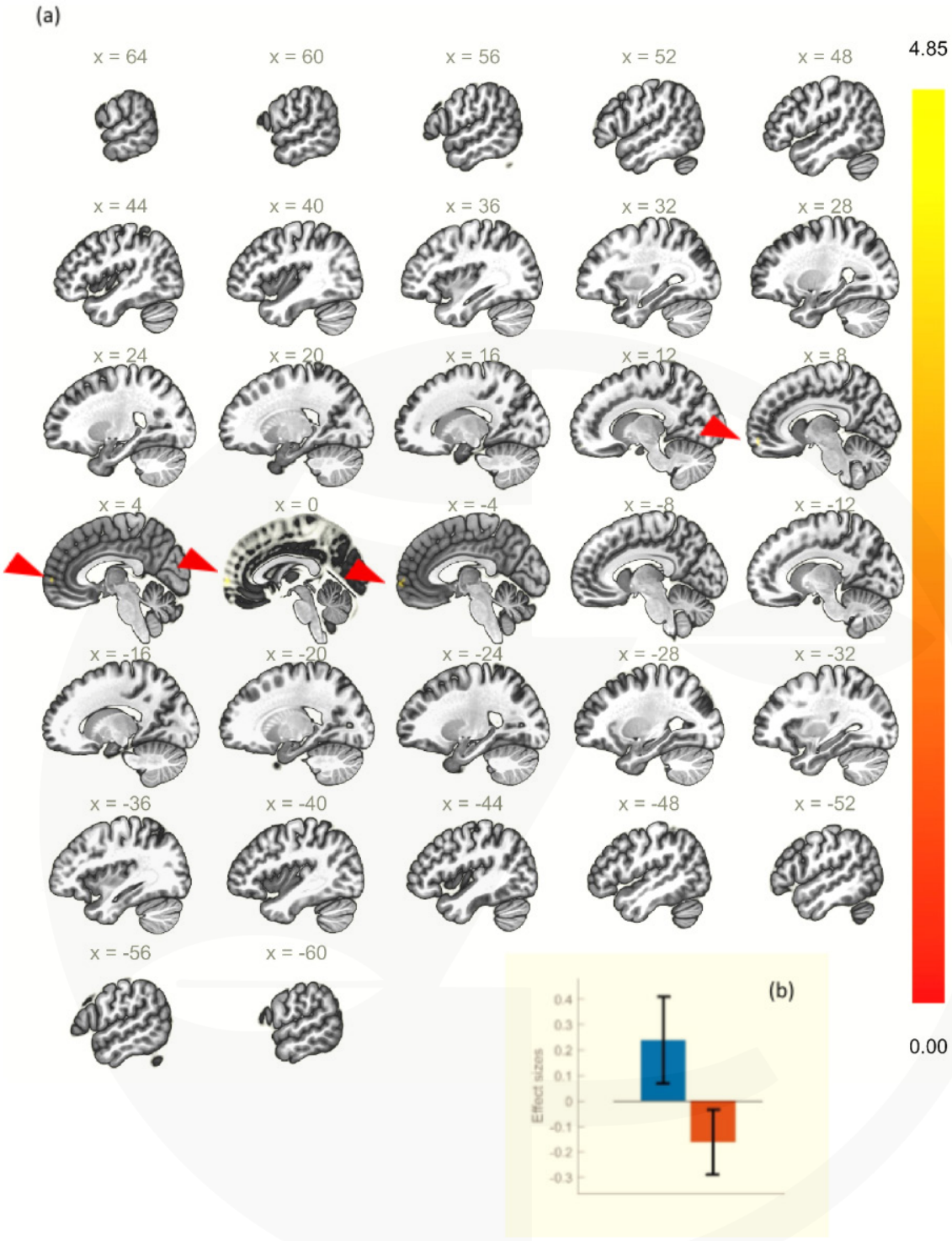


Figure 8. Regions related to functionally deactivated cluster 2 (red arrow) from a: sagittal view and b: its effect size plot showing Faradarmani Consciousness Field Connection with the red bar.

Discussion

In this study, we measured the activation and deactivation of brain regions and analyzed the results using task fMRI and functional connectivity. Based on the results, FCF Connection leads to activation of the frontal regions of the brain. These results are consistent with previous studies on the brain of Faradarmangars [36], in which most activities occurred in the BA6 regions. On the other hand, FCF Connection led to decreased activity in the calcarine limbic lobes and the BA22 temporal lobes. Functional connectivity analysis in activated and deactivated brain regions shows that functional connectivity increases in the BA31 region during the FCF Connection. In contrast to the task state, upon disconnection from the FCF, functional connectivity increases in the BA11/47 region.

Similar to previous findings [36], brain electrical activity increases in the frontal lobes during the FCF Connection. A distinctive feature of the frontal lobe is its role as a traffic hub within the nervous system, connecting to other brain regions and vice versa [38]. In the present study, the BA6 region within the frontal lobe showed the highest activity during FCF Connection. The BA6 region is the largest part of the Brodmann area and is commonly called the premotor cortex, which is involved in determining the sequence and planning of movements [39]. Many functions have been attributed to this region, including a role in cognitive function [40]. Other proposed roles for the BA6 region include memory [41] and attention [42].

After BA6, the BA10/11 part of the frontal lobe is the next region that becomes highly activated; BA10/11 is also part of the prefrontal cortex (PFC) and is located in the anterior part of the frontal lobe. This region developed at one of the latest points in evolutionary time and makes up more than a quarter of the cerebral cortex [43]. Functions attributed to BA10 include memory encoding [41], memory retrieval [44], and working memory [45]. It has also been reported that this part plays a role in personality integration [46]. To date, due to the difficulty of studying the connection between these regions when using fMRI tests, few investigations have been conducted on how this region responds and correlates with personality dimensions.

The decrease in functional connectivity between BA10/11 and BA31 is one of the interesting findings in this study. As suggested in the literature related to the DMN, the default network hubs are typically located between the mPFC and the PCC [15]; the observed decrease may be due to the lack of connection between the activated regions and the default network. This data also rules out the possible simultaneity and connection between the default network and brain activity during FCF Connection.

In this study, during the FCF Connection, we also observe deactivated brain regions. The limbic region of the brain, located on both the left and right sides, is the most primitive part of the brain, shared with other mammals, reptiles, amphibians, and fish. The main functions of this region are regulating emotions, sexual responses, and homeostasis in humans [47]. The decrease in activity in the limbic region during FCF Connection occurs in the calcarine parts, which house the primary visual cortex [48]. Additionally, the optic tracts located within the lobes in the left cortex show decreased activity in the FCF Connection. This decrease is concurrent in the BA22 regions, which are the auditory association cortex [49].

This decrease in activity in the visual and auditory regions of the brain is related to the opening of the eyes in the rest state and the sound signal that is heard at the end of it, signaling entry into the task state. On the other hand, in deactivated regions and the PFC parts (BA47/11), an increase in functional connectivity is observed, which in the case of BA11 correlates with a part of the activated brain regions. This result clearly indicates a change in brain activity between the state related to FCF Connection and the disconnection from it, as a result of the task and rest designed in the present study.

Overall, we can summarize our findings in four parts:
1- FCF has a definite effect on the human brain.
2- FCF leads to the activation of human brain regions and changes the connectivity of various brain networks.

3- The activated parts of the brain are mostly associated with the most advanced frontal regions of the brain, and functional connectivity is activated unlike the default networks (due to the decrease in the BA31 hub).
4- The connection between deactivated and activated regions indicates a switch in the brain of the Faradarmangar, especially in the BA11 region, during the initiation and disconnection of the FCF.

Examining other brain regions and comparing the activities of different regions in larger and more diverse populations can help highlight the significance of FCF Connection and the findings related to its effects. Furthermore, investigating the effects of the FCF on brain function in the treatment of nervous system diseases will be among the future considerations of the authors of this study.

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