

Short Communication**Brain activity and affect: overall and asymmetric activity of the brain lobes in affective states**Shahrokh Makvand Hosseini^{*a}, Siavash Talepassand^a, Iman Bigdeli^a**Abstract**

BACKGROUND: Studies have emphasized on the frontal EEG asymmetry as a mediator of emotional states. This research was aimed to examine the overall and asymmetric activities of the brain lobes under the affective states.

METHODS: A coupling EEG was recorded in an eye closed awakened condition from 40 right handed female students under the baseline and affective states.

RESULTS: Bilaterally decreased activities in anterior and posterior regions and also a superimposed right asymmetry in posterior regions were revealed.

CONCLUSIONS: Variability of frontal, temporal and parietal lobes together with a superimposed relative right posterior activity may mediate affective states.

KEYWORDS: Brain Activity, Brain Lobes, Asymmetry, Affect.

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According to the approach/withdrawal model of frontal EEG asymmetry,¹ stimuli intended to elicit approach-oriented responses should result in an observed relative left frontal EEG activation, while stimuli intended to elicit a withdrawal-oriented response should result in an observed relative right frontal EEG activation. Davidson² has proposed that trait EEG asymmetries index propensities for reacting in predictable ways to emotionally evocative stimuli. He has called this propensity "affective style" and proposed that frontal EEG asymmetry indexes a system that may have emotion-specific or valence-specific moderating influences, with implications for risk for psychopathology. However, more recent studies have suggested the bilateral frontal activity as an important function relating to positive and negative affects.^{3,4} There are evidences for the posterior EEG activity as a mediator of emotional states

as well.^{5,6} The main aim of this study was to examine the asymmetric and bilateral activities of the frontal, parietal, temporal and occipital lobe hemispheres in reaction to four affective states (relaxed, happy, anxious and sad) using short movie clips.

Methods*Participants*

Participants for the study were 40 right handed female students (21-24 years old), all reported being free from current or past history of head injuries, mental or neurological disorders and drugs.

Affective Stimuli

Four affective tune clips (3 min) were selected among cinema and documentary repertoires and presented to subjects in a random order. The average of self reports in a previous study (likert, scale of 1-7) have been reported 4.61,

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4.43, 4.03, 5.61 for relaxed, happy, anxious and sad states, respectively.⁷

Procedure

Study was conducted in an EEG laboratory in the Semnan University under supervisory of neurologists during year 2008. A coupling eye closed awakened EEG was recorded in 16 electrode sites in pre-stimulus (viewing dark computer screen) and post-stimulus condition (viewing movie clips). Ten 2-s chunks of artifact-free data were analyzed using Fast Fourier Transformation (FFT) with a hamming window and estimates of absolute spectral power were generated for the alpha band (8-13Hz). A guiding assumption underlying the interpretation of findings involving EEG alpha asymmetry is that greater alpha power is indicative of less cortical activity in broad underlying regions.⁸

Results

State and State*Side Effects

Multivariate repeated measures were applied for statistical analysis. Significant within subjects' effects were revealed for state*side (Wilks' Lambda = 0.112, F = 30.651, p < 0.001) and for state effects (Wilks' Lambda = 0.09, F = 35.127, p < 0.001). Univariate test were reflected a significant effect for temporal and parietal lobes. A significant effect was also found

for "state" in frontal temporal and parietal lobes (see table 1). Consequently, pair wise comparison between affective states, based on estimated marginal means and Benferroni adjustment revealed significant differences (p < 0.001) between five states.

Table 1. Univariate test for "state" and "state*side" effects

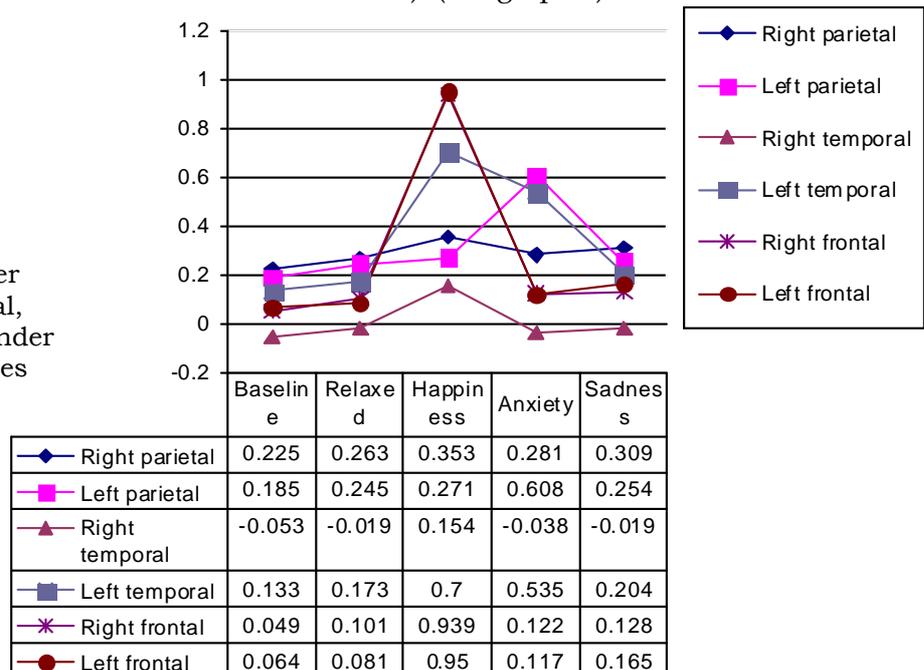
Source	Measure	Type III Sum of Squares	F
State	Frontal	45.67	96.515 †
	Temporal	8.27	20.295 †
	Parietal	6.29	14.121 †
	Occipital	0.47	1.077
State*Side	Frontal	0.04	0.879
	Temporal	3.13	95.958 †
	Parietal	3.59	140.593 †
	Occipital	0.07	1.109

† p < 0.001, df = 4

Overall and Asymmetric Activity

The baseline-affective states comparison showed significant differences (p < 0.001) for overall frontal (in happy state) temporal and parietal lobes (in happy and sad states). Results were also revealed significantly right asymmetry (increase in relative right activity) (p < 0.001) for temporal (in all states) and parietal lobes (in baseline, happy, anxious and sad states). (See graph 1)

Graph 1. Absolute alpha power means for left and right frontal, temporal and parietal lobes under the baseline and affective states



Conclusions

Bilateral decrease activity of the frontal lobe during the happy state could be interpreted as variability of overall frontal region to happy state and was congruent with those who have emphasized on bilateral variations in brain regions under affective states.^{3,4} The parietal and temporal lobes' variability in happy and anxious states (decrease in activity) were also suggested these as important regions related to positive and negative effect. The right asymmetry in temporal and parietal lobe during

most affective states were highlighted right posterior activity as an important function related to affective states as well. These findings were compatible with those who emphasized on the role of right posterior regions in affective states.^{5,6}

Overall variability of frontal, temporal and parietal lobes as well as relative right temporal and parietal activity (right asymmetry) seems to mediate positive and negative affective states.

Conflict of Interests

Authors have no conflict of interests regarding this paper.

Authors' Contributions

ShMH has conducted the research, supervised all parts of the experiment and prepared the manuscript. ST and IB have coordinated in the statistical analysis and provided important technical support for the experiment. All authors have read and approved the content of the manuscript.

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