

**DISCOVERING NEURAL SIGNATURES OF
ALPHA BRAINWAVE INDICATIVE OF
ATTENTIONAL EFFECT DURING MELODIC
AND RHYTHMIC QURANIC RECITATION: A
STUDY OF UNIVERSITI SAINS MALAYSIA
HEALTH CAMPUS COMMUNITY**

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UNIVERSITI SAINS MALAYSIA

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by

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TABLE OF CONTENTS

ACKNOWLEDGEMENT	ii
TABLE OF CONTENTS	iv
LIST OF TABLES	x
LIST OF FIGURES	xiv
LIST OF SYMBOLS	xviii
LIST OF ABBREVIATIONS	xix
LIST OF ARABIC TERMINOLOGIES	xxi
ABSTRAK	xxii
ABSTRACT	xxiii
CHAPTER 1 INTRODUCTION	24
1.1 Background.....	24
1.2 Problem statement and study rationale	26
1.3 Research questions.....	28
1.4 Research hypotheses	29
1.5 Research objectives	29
1.5.1 General objective.....	29
1.5.2 Specific objectives.....	30
1.6 Significance of study	30
CHAPTER 2 LITERATURE REVIEW	32

2.1	Alpha rhythm properties and cognitive correlates	33
2.2	Attention networks and reward system.....	35
2.3	Electromagnetism properties of EEG and MEG	36
2.4	Integrated EEG-MEG recording.....	38
2.5	The grandeur of Holy Quran recitation styles	40
2.6	The virtues of <i>Ayatul Kursi</i>	42
2.7	Flow diagram.....	44
2.8	Type of association.....	46
 CHAPTER 3 METHODOLOGY AND METHODS		47
3.2	Ethical approval.....	47
3.3	Research design	47
3.4	Location of the study	47
3.5	Experimental workflow	48
3.6	Research subjects.....	48
3.6.1	Inclusion and exclusion criteria.....	49
3.6.2	Sample size determination.....	50
3.6.3	State-Trait Anxiety Inventory (STAI).....	51
3.7	Stimuli design.....	53
3.7.1	Quranic stimuli design.....	55
3.7.1	Non-Quranic stimuli design	56
3.8	EEG and MEG system in use	57
3.8.1	Subject setup for recording session	59
3.8.2	Data overview.....	63
3.9	EEG-MEG signal data analysis	64
3.9.1	Brainstorm software	64

3.9.2	Anatomical co-registration	64
3.9.3	Data pre-processing	65
3.9.3 (a)	Power spectral density (PSD) estimation	67
3.9.3 (b)	Bad channels detection and removal	67
3.9.3 (c)	Power line noise removal	68
3.9.3 (d)	Band-pass filtering.....	69
3.9.3 (e)	Average re-referencing	70
3.9.3 (f)	Maxwell filtering (MaxFilter)	70
3.9.3 (g)	Removal of physiological artefacts	71
3.9.3 (h)	Removal of bad data segment.....	74
3.9.4	Source modelling.....	75
3.9.4 (a)	EEG source modelling.....	76
3.9.4 (b)	MEG source modelling.....	77
3.9.5	Source estimation of alpha activities	77
3.9.5 (a)	Volume source computation.....	79
3.9.6	Spectral power of alpha activities.....	80
3.10	Regions of interest (ROIs).....	81
3.11	Statistical analysis.....	83
CHAPTER 4 RESULTS		84
4.1	Source estimation for alpha activity in MEG and EEG.....	84
4.2	Baseline (resting state).....	84
4.2.1	MEG	85
4.2.2	EEG	86
4.2.3	Summary of average source estimation for resting state alpha frequency band	87

4.3	Quranic recitation stimuli	88
4.3.1	<i>Murattal Asim</i> style	88
4.3.1 (a)	MEG	88
4.3.1 (b)	EEG	89
4.3.1 (c)	Summary of average source estimation for <i>Murattal Asim</i> 's alpha frequency band.....	90
4.3.2	<i>Murattal Susi</i> style.....	91
4.3.2 (a)	MEG	91
4.3.2 (b)	EEG	92
4.3.2 (c)	Summary of average source estimation for <i>Murattal Susi</i> 's alpha frequency band	93
4.3.3	<i>Tarannum Asli</i> style.....	94
4.3.3 (a)	MEG	94
4.3.3 (b)	EEG	95
4.3.3 (c)	Summary of average source estimation for <i>Tarannum Asli</i> 's alpha frequency band.....	96
4.4	Non-Quranic recitation stimuli	97
4.4.1	Arabic news	97
4.4.1 (a)	MEG	97
4.4.1 (b)	EEG	99
4.4.1 (c)	Summary of average source estimation for Arabic news' alpha frequency band	99
4.4.2	Arabic poem	100
4.4.2 (a)	MEG	100
4.4.2 (b)	EEG	102

4.4.2 (c)	Summary of average source estimation for Arabic poem's alpha frequency band.....	103
4.5	Spearman rank correlation.....	104
4.5.1	Resting State.....	104
4.5.1 (a)	MEG.....	104
4.5.1 (b)	EEG.....	105
4.5.2	<i>Murattal Asim</i>	106
4.5.2 (a)	MEG.....	107
4.5.2 (b)	EEG.....	108
4.5.3	<i>Murattal Susi</i>	111
4.5.3 (a)	MEG.....	111
4.5.3 (b)	EEG.....	112
4.5.4	Tarannum Asli.....	115
4.5.4 (a)	MEG.....	115
4.5.4 (b)	EEG.....	116
4.5.5	Arabic poem.....	118
4.5.5 (a)	MEG.....	118
4.5.5 (b)	EEG.....	120
4.5.6	Arabic news.....	122
4.5.6 (a)	MEG.....	122
CHAPTER 5 DISCUSSION.....		127
5.1	Introduction.....	127
5.2	Source estimation for alpha activity during resting state.....	127
5.3	Source estimation for alpha activity during receptive listening to Quranic recitation, <i>Murattal Asim</i> style.....	129

5.4	Source estimation for alpha activity during receptive listening to Quranic recitation, <i>Murattal Susi</i> style.....	130
5.5	Source estimation for alpha activity during receptive listening to Quranic recitations, <i>Tarannum Asli</i> style	132
5.6	Source estimation for alpha activity during listening to non-Quranic stimuli, Arabic poem	134
5.7	Source estimation for alpha activity during listening to non-Quranic stimuli, Arabic news	136
5.8	Differences in alpha activation among Muslim and non-Muslim groups	137
CHAPTER 6 CONCLUSION		140
6.1	Future directions	141
REFERENCES.....		142
APPENDICES.....		170

LIST OF TABLES

	Page
Table 3.1 Stimuli conditions of the study; Quranic recitations and non- Quranic Arabic stimuli	54
Table 4.1 Most pronounced brain regions activated during resting state based on average source estimation in alpha frequency band	87
Table 4.2 Most pronounced brain regions activated during receptive listening to <i>Murattal Asim</i> recitation style based on average source estimation in alpha frequency band.....	90
Table 4.3 Most pronounced brain regions activated during receptive listening to <i>Murattal Susi</i> recitation style based on the average source estimation in alpha frequency band.....	93
Table 4.4 Most pronounced brain regions activated during receptive listening to <i>Tarannum Asli</i> recitation style based on the average source estimation in alpha frequency band.....	96
Table 4.5 Most pronounced brain regions activated during receptive listening to Arabic news based on the average source estimation in alpha frequency band	100
Table 4.6 Most pronounced brain regions activated during receptive listening to Arabic poem based on the average source estimation in alpha frequency band	103
Table 4.7 The brain regions of MEG volume source estimation of alpha brainwaves during resting state in Muslim and non-Muslim groups	104

Table 4.8 The Spearman correlation of MEG alpha source estimation between brain regions during resting state between groups	104
Table 4.9 The brain regions of EEG volume source estimation of alpha brainwaves during resting state in Muslim and non-Muslim groups	105
Table 4.10 The Spearman correlation of EEG alpha source estimation between brain regions during resting state between groups	106
Table 4.11 The brain regions of MEG volume source estimation of alpha brainwaves during receptive listening to <i>Murattal Asim</i> in Muslim and non-Muslim groups	107
Table 4.12 The Spearman correlation of MEG alpha source estimation between brain regions for <i>Murattal Asim</i> in Muslim group	107
Table 4.13 The Spearman correlation of MEG alpha source estimation between brain regions for <i>Murattal Asim</i> in non-Muslim group	108
Table 4.14 The brain regions of EEG volume source estimation of alpha brainwaves during receptive listening to <i>Murattal Asim</i> in Muslim and non-Muslim groups	108
Table 4.15 The Spearman correlation of EEG alpha source estimation between brain regions for <i>Murattal Asim</i> in Muslim group	109
Table 4.16 The Spearman correlation of EEG alpha source estimation between brain regions for <i>Murattal Asim</i> in non-Muslim group	110
Table 4.17 The brain regions of MEG volume source estimation of alpha brainwaves during receptive listening to <i>Murattal Susi</i> in Muslim and non-Muslim groups	111

Table 4.18 The Spearman correlation of MEG alpha source estimation between brain regions for <i>Murattal Susi</i> in Muslim group.....	111
Table 4.19 Spearman correlation of MEG alpha source estimation between brain regions for <i>Murattal Susi</i> in non-Muslim group	111
Table 4.20 The brain regions of EEG volume source estimation of alpha brainwaves during receptive listening to <i>Murattal Susi</i> in Muslim and non-Muslim groups	112
Table 4.21 The Spearman correlation of EEG alpha source estimation between brain regions for <i>Murattal Susi</i> in Muslim group.....	113
Table 4.22 The Spearman correlation of EEG alpha source estimation between brain regions for <i>Murattal Susi</i> in non-Muslim group	114
Table 4.23 The brain regions of MEG volume source estimation of alpha brainwaves during receptive listening to <i>Tarannum Asli</i> in Muslim and non-Muslim groups	115
Table 4.24 The Spearman correlation of MEG alpha source estimation between brain regions for <i>Tarannum Asli</i> in Muslim group.....	115
Table 4.25 Spearman correlation of MEG alpha source estimation between brain regions for <i>Tarannum Asli</i> in non-Muslim group	116
Table 4.26 The brain regions of EEG volume source estimation of alpha brainwaves during receptive listening to <i>Tarannum Asli</i> in Muslim and non-Muslim groups	116
Table 4.27 The Spearman correlation of EEG alpha source estimation between brain regions for <i>Tarannum Asli</i> in Muslim group.....	117
Table 4.28 The Spearman correlation of EEG alpha source estimation between brain regions for <i>Tarannum Asli</i> in non-Muslim group	117

Table 4.29 The brain regions of MEG volume source estimation of alpha brainwaves during receptive listening to Arabic Poem in Muslim and non-Muslim groups.....	118
Table 4.30 The Spearman correlation of MEG alpha source estimation between brain regions for Arabic poem between groups	119
Table 4.31 The brain regions of EEG volume source estimation of alpha brainwaves during receptive listening to Arabic poem in Muslim and non-Muslim groups.....	120
Table 4.32 The Spearman correlation of EEG alpha source estimation between brain regions for Arabic poem between groups	121
Table 4.33 The brain regions of MEG volume source estimation of alpha brainwaves during receptive listening to Arabic news in Muslim and non-Muslim groups.....	122
Table 4.34 The Spearman correlation of MEG alpha source estimation between brain regions for Arabic news between groups	123
Table 4.35 The brain regions of EEG volume source estimation of alpha brainwaves during receptive listening to Arabic News in Muslim and non-Muslim groups.....	124
Table 4.36 The Spearman correlation of EEG alpha source estimation between brain regions for Arabic news between groups	125

LIST OF FIGURES

	Page
Figure 2.1 EEG reading that shows alpha waves properties during eye opening and eye closing condition.	34
Figure 2.2 The dorsal attention network (DAN) and ventral attention network (VAN).....	36
Figure 2.3 Hypothetical EEG and MEG field patterns over the scalp.	38
Figure 2.4 Schematic overview of the scale of spatial and temporal resolution of various non-invasive and invasive neuroimaging modalities..	39
Figure 2.5 Structural breakdown of <i>Ayatul Kursi</i> verse. Error! Bookmark not defined.	
Figure 2.6 The conceptual framework of present study.....	45
Figure 3.1 The overall workflow of present study.	48
Figure 3.2 Recording session of auditory stimuli involving different Quranic recitations' styles by Sheikh Hisyam Abdul Baari Muhammad Rajih	56
Figure 3.3 The distribution map for EEG electrodes of Waveguard EEG Cap 61-channel AntNeuro.	58
Figure 3.4 The distribution map for MEG sensors of Elekta Neuromag 306-channel MEG system.....	59
Figure 3.5 Subject undergoing head digitization on mounted EEG cap.	61
Figure 3.6 Left: A 3D Cartesian plane visualization before and after digitization.....	61
Figure 3.7 Impedance check for EEG electrodes.....	62
Figure 3.8 Subject undergoing simultaneous EEG-MEG brain recording in an MSR.....	63

Figure 3.9 General overview of the Brainstorm interface.....	64
Figure 3.10 Projection of EEG electrodes onto scalp surface.....	65
Figure 3.11 Extracted PSD from MEG. with plots indicating gradiometer data and magnetometer data.....	67
Figure 3.12 Full EEG recording before and after excluding EEG bad channel.....	68
Figure 3.13 Unfiltered and filtered PSD plots after power line noises removal by notch filter.	69
Figure 3.14 Power spectral density, log-scaled. PSD plot post band-pass filter configuration.....	70
Figure 3.15 Unfiltered and filtered PSD plots of MEG raw data after MaxFilter application.	71
Figure 3.16 Ocular artefact and cardiac artefact as recorded by EOG and ECG.....	72
Figure 3.17 EEG topographic maps from ICA components.....	73
Figure 3.18 MEG topographic maps from MEG components.....	74
Figure 3.19 Identification and marking of bad segment	75
Figure 3.20 EEG-informed, computed BEM volume conduction head model.....	76
Figure 3.21 MEG-informed, computed OS volume conduction head model.	77
Figure 3.22 Central concept related to the current EEG-MEG study.	79
Figure 3.23 MRI views of alpha volume source estimation.	80
Figure 3.24 3-D view of 170 anatomical brain regions defined by AAL3 atlas.....	83
Figure 4.1 MEG volume source estimation of average alpha activity in the resting state between Muslim and non-Muslim groups in different MRI-Neurological views	85

Figure 4.2 EEG volume source estimation of average alpha activity in the resting state between Muslim and non-Muslim group in different MRI-Neurological views	86
Figure 4.3 The average alpha source estimation in MEG <i>Murattal Asim</i> recitation style between Muslim and non-Muslim groups in different MRI-Neurological views.	88
Figure 4.4 The average alpha source estimation in EEG <i>Murattal Asim</i> recitation style between Muslim and non-Muslim groups in different MRI-Neurological views.	89
Figure 4.5 The average alpha source estimation in MEG <i>Murattal Susi</i> recitation style between Muslim and non-Muslim groups in different MRI-Neurological views.	91
Figure 4.6 The average alpha source estimation in EEG <i>Murattal Susi</i> recitation style between Muslim and non-Muslim groups in different MRI-Neurological views.	92
Figure 4.7 The average alpha source estimation in MEG <i>Tarannum Asli</i> recitation style between Muslim and non-Muslim groups in different MRI-Neurological views	94
Figure 4.8 The average alpha source estimation in EEG <i>Tarannum Asli</i> recitation style between Muslim and non-Muslim groups in different MRI-Neurological views.	95
Figure 4.9 The average alpha source estimation in MEG Arabic News between Muslim and non-Muslim groups in different MRI-Neurological views.....	98

Figure 4.10 The average alpha source estimation in EEG Arabic News between Muslim and non-Muslim groups in different MRI-Neurological views.....	99
Figure 4.11 The average alpha source estimation in MEG Arabic Poem between Muslim and non-Muslim groups in different MRI-Neurological views.....	101
Figure 4.12 The average alpha source estimation in EEG Arabic Poem between Muslim and non-Muslim groups in different MRI-Neurological views.....	102

LIST OF SYMBOLS

Hz	Hertz
kOhm	Kilo Ohm
n	number of subjects in groups
N	total number of subjects
s	seconds

LIST OF ABBREVIATIONS

AAL3	automated anatomical labelling atlas 3
CA	classical Arabic
DAN	dorsal attention network
dIPFC	dorsolateral prefrontal cortex
DMN	default mode network
dmPFC	dorsomedial prefrontal cortex
ECG	electrocardiography
EEG	electroencephalography
EOG	electrooculography
fMRI	functional magnetic resonance imaging
GUI	graphical user interface
HPI	head position indicator
MSA	modern standard Arabic
MEG	magnetoencephalography
mPFC	medial prefrontal cortex
MCC	midcingulate cortex
MRI	magnetic resonance imaging
MTL	medial temporal lobe
OFC	orbitofrontal cortex
OM	openmonitoring (meditation)
PBUH	peace be upon him
PCC	posterior cingulate cortex
PET	positron emission tomography
PFC	prefrontal cortex
PSD	power spectral density
ROI	region of interest
TPJ	temporo-parietal junction

VAN	ventral attention network
vIPFC	ventrolateral prefrontal cortex
vmPFC	ventromedial prefrontal cortex

LIST OF ARABIC TERMINOLOGIES

Asim	moderate tempo, first style of quranic recitation
Hadr	fast tempo of Quranic recitation
Huffaz	people who memorize Al-Quran
Kursi	throne
Murattal	adjective of <i>tarteel</i>
Qiraat	ways and manners of recitation of Al-Quran
Ruqyah	a practice of treating illness with Quranic verses
Surah	chapter
Susi	moderate tempo, second style of quranic recitation
Tadwir	medium tempo of Quranic recitation
Tahqiq	slow tempo of Quranic recitation
Tajweed	rules of Quranic recitation
Tarteel	clear and correct articulation

**MENEROKA SUMBER NEURAL GELOMBANG OTAK ALFA SEBAGAI
PETANDA KESAN PERHATIAN SEMASA PEMBACAAN AYAT QURAN
SECARA BERMELODI DAN BERITMA**

ABSTRAK

Perhatian adalah satu ciri-ciri kognitif bagi gelombang otak alfa (8-13 Hz). Kitab suci Al-Quran telah lama dikaitkan dengan menyumbang kepada banyak manfaat secara psikologi, antaranya, kesan perhatian. Walaupun hubungkait antara kajian neurosaintifik dengan pembacaan Al-Quran semakin meningkat sejak dua dekad yang lalu, penemuan yang mendorong kepada kesan perhatian adalah kurang. Dalam kajian ini, tiga puluh orang (N=30) peserta yang sihat (n Muslim=15, bukan Muslim=15) telah direkrut dan mereka tertakluk kepada pendengaran lima rangsangan auditori secara pasif selama tiga minit setiap satu, yang terdiri daripada rangsangan berasaskan Al-Quran dan bukan berasaskan Al-Quran. Bagi mempamerkan secara visual sumber neural dan spectrum kuasa alfa, teknik pengimejan neuro iaitu perakaman electroencephalography-magnetoencephalography (EEG-MEG) secara komplementari digunakan. Signal asli otak diproses dan dianalisa menggunakan perisian Brainstorm. Sewaktu rangsangan auditori diberikan, kawasan otak seperti precuneus, cuneus, calcarine, parietal dan occipital menunjukkan pengurangan dalam pengaktifan secara signifikan, yang berbalas kepada kuasa alfa yang lebih tinggi. Peningkatan kuasa alfa ini menunjukkan kesan perhatian. Data ini menggariskan idea bahawa kesan perhatian yang didorong oleh pembacaan Al-Quran berupaya digunakan untuk mempertingkatkan tahap perhatian.

**DISCOVERING NEURAL SIGNATURES OF ALPHA BRAINWAVE
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ABSTRACT

Attention is an established cognitive feature of alpha brainwaves (8-13 Hz). The Holy Quran has long been established to contribute to many psychological benefits, among others, the attentional effect. While research on the neuroscientific correlates of Quranic recitation is increasing over the past two decades, findings that project it to attention-inducing effect is scarce. In the present study, thirty (N=30) healthy participants (n Muslim=15, non-Muslim=15) were recruited and subjected to passive listening of five auditory stimuli, for three minutes each, consisting of Quranic and non-Quranic stimuli. To visualize the neural sources and the spectra of alpha power, the neuroimaging technique of complementary electroencephalography-magnetoencephalography (EEG-MEG) recording is used. The raw brain signals were processed and analysed using Brainstorm software. During the presentation of auditory stimuli, brain regions such as the precuneus, cuneus, calcarine, parietal and occipital showed significantly less neural activation, which reciprocated to higher alpha power. The increment in alpha power reflected attentional effect. The data underlines the idea that attention effect induced by Quranic recitation can plausibly be used to enhance attention level.

CHAPTER 1

INTRODUCTION

1.1 Background

Attention is a core property of all perceptual and cognitive operations. It is an important skill needed for every individual to navigate through distractions and into accomplishing desired goals. The term “attention” could be described as how salience or goals prioritize a subset of external inputs or internal states (Chun *et al.*, 2011). The realization that attention plays many roles in cognition leads to various approaches being introduced with hopes of achieving improved attention (Lippelt *et al.*, 2014; Nan *et al.*, 2022; Semple, 2010; Wolkin, 2015), and one way could plausibly be from the use of Holy Quran.

The Holy Quran is Allah’s gift to humanity and is a miracle that testified the prophethood of Prophet Muhammad (PBUH). It contains inexhaustible wisdom in which Muslims believe as an eternal source of divine guidance for humankind. It is, therefore, imperative that Muslims respond to the Divine Word most appropriately, most preferably by reciting and listening to the Quran. In the last two decades, there have been reasonable amount of works on the effect of Quranic recitation listening presented, these include calmness and relaxation (Ab Rani *et al.*, 2015; Kannan *et al.*, 2022; Nayef & Wahab, 2018; Reza & Mustapha, 2012; Zaidah & Imaduddin, 2018), improving mental health (Ghiasi & Keramat, 2018; Jabbari *et al.*, 2020; Mahjoob *et al.*, 2016) and attention (Samhani *et al.*, 2018; Sirin *et al.*, 2021). All these effects are believed to be partly attributed to the melodic, rhythmic styles of recitations that induce theta and alpha frequency brainwaves (Kamal *et al.*, 2013; Puri, 2017).